Int. Fin. Markets, Inst. and Money 39 (2015) 65–88

Contents lists available at ScienceDirect

Journal of International Financial Markets, Institutions & Money

journal homepage: www.elsevier.com/locate/intfin

Education and the local equity bias around the world☆

Udichibarna Bose, Ronald MacDonald, Serafeim Tsoukas*

Department of Economics, Adam Smith Business School, University of Glasgow, G12 8QQ, UK

ARTICLE INFO

Article history:
Received 12 July 2014
Accepted 16 June 2015
Available online 24 June 2015

JEL classification:
F30
G11
G23
E20

Keywords:
Home bias
Equity markets
International diversification
Education
Financial crisis

ABSTRACT

Using a panel of 38 economies, over the period 2001–2010, we analyse the link between different facets of education and diversification in international portfolios. We find that university education, mathematical numeracy, in addition to financial skill, play an important role in reducing home bias. After separating countries according to their level of financial development, we find that less developed economies with more university graduates, or with higher level of mathematical numeracy, have lower level of local equity bias compared to more developed countries. We also find that the beneficial effect of education is more pronounced during the most recent financial crisis, especially for economies with less developed financial markets.

1. Introduction

A topic of considerable recent interest in international capital markets is the extent to which equity portfolios are concentrated in investors' domestic markets. Investors seem reluctant to reap the full benefits of international diversification and overinvest in their domestic assets rather than in international portfolios. This preference is commonly termed as the '*Home bias puzzle*' and has attracted a great amount of attention in the recent literature (see Sercu and Vanpée, 2007, 2012). Following the seminal work of French and Poterba (1991), several authors have documented a number of plausible explanations, which primarily focus on institutional factors or individual investor behaviour (see Lewis, 1999; Karolyi and Stulz, 2003; Sercu and Vanpée, 2012 for surveys). However, the role of education in international portfolio diversification is less researched. Our aim in this paper is to fill this gap by exploring the link between various measures of education and equity home bias, paying special attention to the heterogeneity in financial development and the most recent financial crisis.

The last two decades have seen a phenomenal growth of financial instruments and products, as evidenced by a number of new assets that were developed based on subprime and other mortgages before the 2007–2010 global financial crisis.

☆ We are grateful to Lieven De Moor and Rosanne Vanpée for making available to us the market capitalisation data of equities. We also thank John Burger, Alessio Ciarlone and participants at the SGPE Crieff Conference (2013), the 4th EMG-ECB Emerging Markets Finance Conference (2014), the 12th INFINITI Conference on International Finance (2014), the 29th Annual Congress of the European Economic Association (2014) and the 2015 Annual Conference of the Royal Economic Society for useful comments and suggestions. The first author gratefully acknowledges financial support from the Economic and Social Research Council (Grant number: ES/J500136/1). Any remaining errors are our own.

* Corresponding author. Tel.: +44 141 330 6325.
E-mail address: serafeim.tsoukas@glasgow.ac.uk (S. Tsoukas).

http://dx.doi.org/10.1016/j.intfin.2015.06.002

However, the ability of investors to make sound financial decisions on the basis of these new assets was severely challenged in the light of the massive losses incurred during this period (see Klapper et al., 2013). This process has underlined the need for better education and financial awareness among citizens, educators, community groups, businesses, policymakers and government agencies to ensure their financial security (see Lusardi, 2008; Lusardi and Tufano, 2009; Gerardi et al., 2010). The extant literature on financial literacy is concerned with the links between financial knowledge, saving and investment behaviour (see Jappelli and Padula, 2013; Lusardi et al., 2013), and has considered the role of education and financial literacy in many aspects of economic behaviour, both at the micro and the macro level (see Stango and Zinman, 2009; Guiso and Jappelli, 2005, 2008, for surveys). For example, this literature demonstrates a clear relationship between borrowing and investment decisions of individuals and a number of researchers have shown that a lack of education and knowledge leads to poor risk diversification and inefficient portfolio allocations (Christelis et al., 2010). At the macro level, economic literacy is essential for the good and efficient working of the markets and policies. A lack of financial knowledge, on the other hand, can result in an increase of deceitful financial practices and unfair competition in financial markets (Jappelli, 2010). Therefore, both micro and macro studies conclude that we should observe a direct and positive relation between financial education and financial decision making (Hilgert et al., 2003; Cole et al., 2011).

One popular finding in the financial literacy literature postulates that formal education matters for the process of financial decision making (see Graham et al., 2009; Cole et al., 2012) and financial participation (see Karlsson and Nordén, 2007; Van Rooij et al., 2011). Education also works through the behavioural patterns of investors. In particular, educated investors demonstrate a higher level of competence and invest more heavily in foreign equities compared to individuals with lower levels of education (Heath and Tversky, 1991; Bernheim and Garrett, 2003; Magi, 2009). Thus, knowledgeable, educated and more financially capable people are able to manage their finances better by making good and profitable decisions for their economic security and well-being.

The purpose of this paper is to bridge the strands of the literatures on international portfolio diversification and education in order to provide, a systematic empirical analysis of the impact of education on equity holdings, taking into account both the different degree of financial development among economies and the most recent financial crisis. The motivation for exploring the role of education in equity portfolios stems from the fact that education influences financial awareness, knowledge, skills, attitude and the behaviour of investors to make sound financial decisions in order to achieve individual financial well-being. Lack of education and financial awareness, on the other hand, can be key reasons behind the lower degree of international portfolio diversification and an increasing reliance on domestic equity portfolios. Hence, education and potentially financial literacy help to reduce information acquisition costs related to foreign investment opportunities, improving the awareness of the benefits and risks of international portfolio diversification.

In our study, we also recognise that education may not influence all economies in a similar way. We allow for the fact that economies with different levels of financial development might respond to improvements in the level of education differently, since emerging market economies typically find it difficult, or prohibitively expensive, to access foreign financial markets (Mizen and Tsoukas, 2010; Mizen et al., 2012). However, emerging markets have experienced considerable development in their financial markets over the past few decades accompanied by lower inflation, stronger institutions and creditor rights (Burger and Warnock, 2003, 2006). In addition, the link between different levels of education and portfolio diversification should be more potent during extreme economic events, such as the most recent financial crisis. Gerardi et al. (2010) show that limited financial literacy (numerical ability) played an important role in the recent subprime mortgage crisis in the US. Thus, the link between education and financial literacy is likely to be more potent during the financial crisis as it might help in resolving information asymmetries in the economy and improve investors' competence level and cognitive abilities.

The value added of the present paper is threefold. First, we consider a direct role of education in influencing the equity home bias. In addition to the country-specific and financial indicators previously considered, this study also considers the impact of different measures of education. This approach complements the existing empirical literature on international portfolio holdings (see Chan et al., 2005; Fidora et al., 2007; De Moor and Vanpée, 2013), which highlights the effect of different institutional and financial factors, geographical, political and behavioural effects on home bias in international portfolios.

The second main contribution of this paper is that, using comparable multi-country panel data, we are able to identify which countries are more likely to benefit by the reduction in equity home bias from a higher level of education. Intuitively, we do not expect all countries to be equally affected by education. It is widely accepted that economic literacy differs extensively across countries and tends to be rather limited in poorer demographic groups (Jappelli, 2010). Countries with higher levels of education tend to benefit much more from financial liberalisation (Bekaert et al., 2001). In this paper, we test whether there is a differential effect of education on international diversification for economies with more and less developed financial markets.

Finally, we assess whether the education-home bias nexus has evolved over time for economies with more and less financially developed markets. The most recent financial crisis has provided fertile ground for analysing the changes and developments that took place in the financial systems of several countries. During the crisis period, markets faced macroeconomic imbalances, liquidity risk and international risk, leading to the possibility of contagion (Arghyrou and Kontonikas, 2012). Hence, there is a need of financial awareness among investors to make correct investment decisions during periods of distress. The pattern of capital flows was vastly heterogeneous across countries during the crisis as investors tried to reduce their international exposure and accordingly increase their exposure in improved economic conditions (Raddatz and

Schmukler, 2012). This, in turn, resulted in a decline in the assets invested abroad and thus an increase in the proportion of equity portfolios which are concentrated in the domestic market of investors (Milesi-Ferretti and Tille, 2011).

The paper is organised as follows. In Section 2 we offer a brief review of the relevant literature. In Section 3 we describe the econometric modelling strategy. We present the data used in our empirical analysis along with summary statistics in Section 4, and we report the econometric results in Section 5. In Section 6 we subject our main models to a battery of additional tests and we provide concluding remarks in Section 7.

2. Review of existing literature

There is a wide literature which highlights the advantages of international portfolio diversification utilising US data. These studies show that diversification of portfolios reduces risk (Solnik, 1974) and that benefits can be attained by investing in emerging markets (Harvey, 1995). Rowland and Tesar (2004) show that investments in stocks of multinational firms can be profitable and hence, utility gains from the addition of international assets to a benchmark portfolio of domestic equities are substantial. However, for investors in emerging markets, international diversification is likely to be more beneficial as these countries typically face higher risk (Driessen and Laeven, 2007). Despite the gains from international diversification, investors still tend to invest more in their domestic stock and bond markets.

Since the path breaking work of French and Poterba (1991) and Tesar and Werner (1995), who provided evidence of equity home bias of around 94%, 98% and 82% of their total equity investments in the US, Japan and the UK respectively, several justifications have been offered in the literature for the existence of the equity home bias puzzle. These include institutional explanations, such as hedging possibilities. For instance, studies by Adler and Dumas (1983) and Cooper and Kaplanis (1994) identified domestic risk hedging as an important explanation for home bias. Other proposed explanations include hedging foreign exchange risk (Fidora et al., 2007; Mishra, 2011), transaction costs and barriers to international investments (Stulz, 1981), information asymmetries (Kang and Stulz, 1997; Ahearne et al., 2004; Ivkovic and Weisbenner, 2005), geographical proximity and familiarity (Coval and Moskowitz, 1999; Kilka and Weber, 2000), corporate governance and transparency (Gelos and Wei, 2005) and behavioural explanations such as familiarity with one's domestic companies, optimism about domestic equity market and asymmetric expectations (Fellner and Maciejovsky, 2003). Detailed literature reviews on home bias are provided by Lewis (1999) and Sercu and Vanpée (2012). The consensus is that equity home bias is a complex phenomenon and is probably caused by a combination of behavioural and institutional biases.

In the financial capability literature, Bernheim (1995, 1998) highlighted that most individuals lack basic financial knowledge and numeracy. Numerous surveys have emphasised that specific sub-groups in the US population and elsewhere have very low levels of economic and financial literacy (Hilgert et al., 2003; Agnew and Szykman, 2005; Lusardi and Mitchell, 2011a,b,c). Studies generally confirm the importance of financial literacy training by showing a direct and positive relation between financial education and financial decision making (Hilgert et al., 2003; Cole et al., 2011). Education also helps in increasing participation in stock market investments (Van Rooij et al., 2011) and diversification of portfolios (Campbell, 2006). In addition, it influences borrowing decisions and retirement planning (Cole et al., 2012; Lusardi and Mitchell, 2007; Klapper and Panos, 2011).

Education further impacts on financial behaviour and educated investors demonstrate greater optimism towards financial markets (Puri and Robinson, 2007), better planning in terms of retirement and making crucial financial decisions (Lusardi and Mitchell, 2007, 2011a,b). Since the end of the 1980s, there has been more deregulation and financial innovation resulting in more availability of financial investment options in equities. Many researchers have found that a lack of knowledge leads to poor risk diversification, inefficient portfolio allocations and a low savings rate. Banks and Oldfield (2007) analysed the numerical ability and other aspects of cognitive ability among a sample of older adults in England and found that numeracy levels are strongly correlated with understanding of pension arrangements, perceived financial security, retirement saving measures and investment portfolios.

The international evidence highlights the existence of very low levels of financial literacy around the world. In an earlier survey, the Organization for Economic Co-operation and Development (OECD, 2005) confirmed that widespread financial illiteracy prevails in countries such as Europe, Australia, and Japan. Jappelli (2010) shows wide diversities in the levels of economic literacy, pointing out that lower levels of development in stock and credit markets are related with lower levels of economic literacy.[1]

The studies discussed above provide a useful background for the linkage between education and equity portfolio diversification. In the home bias context, very few studies address this issue. Karlsson and Nordén (2007) provide evidence that higher levels of education are associated with a lower likelihood of home bias, focusing on the portfolios which formed a part of the Swedish pension plan. Kimball and Shumway (2010) show that financial education has significant explanatory power in home bias and market participation by developing an index of investor sophistication derived from April 2005 Survey of US Consumers. Giofre (2012) also documents the impact of financial education and investor protection on equity portfolios. Yet, the above studies do not take into account the heterogeneity of financial development at the country level, nor do they extend to the recent financial crisis. In this paper, we ask how important are various measures of education in

[1] In Jappelli's (2010) study, the statistics of economic literacy range from a score of less than 3 in South Africa, Venezuela, Peru, Mexico, and Croatia to a score of above 7 for Ireland, Finland, and Singapore.

determining equity portfolios taking into account both the degree of financial development and the recent global financial crisis. In the sections that follow we turn to our estimation strategy and data.

3. Empirical implementation

3.1. The baseline specification

In order to establish whether different measures of education affect international diversification in equity markets, we model the determinants of equity home bias and check whether education is a significant determinant. Following the recent literature on international diversification (see Chan et al., 2005; Mondria and Wu, 2013) our empirical models are estimated using Ordinary Least Squares (OLS).[2] We also generate a dummy variable to capture financial development (*Fin.Dev*), which takes the value one if a country's stock market capitalisation is greater than the mean and zero otherwise. The *Fin.Dev* dummy enters on its own in order to gauge the direct impact of financial development on equity home bias. We consider the following baseline model:

$$EHB_{it} = a_0 + a_1 Edu_{it} + a_2 Fin.Dev_{it} + a_3 \chi_{it} + e_{it}, \tag{1}$$

where $i = 1, 2, \ldots, N$ refers to the cross-section of units (countries in this case), $t = 1, 2, \ldots, T$ refers to the time period, EHB_{it} is the dependent variable of equity home bias for country i and year t, respectively. *Edu* denotes education in country i and year t measured in three different ways using country averages of tertiary education, mathematical numeracy taken from OECD-PISA test scores and the degree of managers' financial skills. χ is the vector of country-specific factors which includes macro-economic conditions, information related-variables, financial liberalisation, financial market development, diversification benefits and financial factors and finally, foreign exchange risk. e_{it} is a disturbance term which varies with time and across different countries. In order to control for cyclical factors originating from the business cycle we include time dummies in our regressions. We also include country dummies that take into account cross-country differences. Finally, standard errors are clustered at the country level to control for serial correlation across countries.

The dependent variable is the home bias measured for equity markets. Following Cooper and Kaplanis (1994), Sercu and Vanpée (2007, 2012) and De Moor and Vanpée (2013), the equity home bias in a country is calculated as the difference between the proportion of the total equity portfolio invested in home equity and the relative weight of the domestic stock market in the global equity market capitalisation. Thus,

$$EHB_{it} = \frac{EQ_{it}}{TEQ_{it}} - \frac{MEQ_{it}}{WEQ_{it}}, \tag{2}$$

where EQ_{it} is domestic equity holdings of investors in country i at time t, TEQ_{it} is the total equity portfolio held by the investors in country i at time t, MEQ_{it} is equity market capitalisation of country i for time t and WEQ_{it} is the total world equity market capitalisation.

The effects of education on various aspects of financial behaviour have been analysed in previous studies (Kennickell et al., 1996; Karlsson and Nordén, 2007; Stango and Zinman, 2009). The upshot is that education is associated with financial sophistication and irreprehensible financial behaviour. Kimball and Shumway (2010) show that investor sophistication has significant explanatory power in home bias and market participation.[3] Departing from this literature, we employ different measures of education to capture, for the first time, the effect of different levels of formal education and finance/numeracy skills on international portfolio diversification, paying special attention to the recent financial crisis and the different levels of financial architecture.

As already noted, education is measured using three different indicators to ensure the robustness of our results.[4] We begin by employing tertiary school enrolment rates to capture the effect of formal education (Jappelli, 2010).[5] We then employ two measures of financial education/numeracy in the spirit of Jappelli (2010). Specifically, we allow for a broader definition of education by using OECD-PISA test scores which indicates mathematical numeracy.[6] We also measure the availability of financial skills from managers' surveys. Both financial skills and mathematical numeracy are good measures of financial literacy since they are related to three concepts of financial knowledge, as identified by Lusardi and Micthell (2014), these are numeracy and capacity to perform calculations related to interest rates and understanding the concepts of inflation

[2] To ensure that our results are not driven by the potential endogeneity in our regressors we also employ instrumental variable (IV) regressions. We instrument different measures of education using primary education enrolment rates and unemployment rates and other financial variables are instrumented using their own values lagged twice.

[3] Kimball and Shumway (2010) develop an index of investor sophistication using the data from April 2005 Survey of Consumers based on a questionnaire of 14 questions.

[4] Table A.1 in Appendix provides precise definitions for the measures of education and other variables.

[5] The World Bank defines tertiary education as university-level education that includes undergraduate or postgraduate education (e.g. universities, colleges, technical training institutes, community colleges, nursing schools, research laboratories, centres of excellence and distance learning centres). We do not take into account primary education as there is a weak relationship between equity home bias and primary education, which is also documented in the scatter plots presented in Appendix (see Fig. A.1).

[6] In 2012, the OECD carried out a large-scale international study to assess numeracy of young people. This data item, however, contains no historical values which are vitally important for the panel dimension of our dataset.

and risk diversification.[7] Higher levels of *education* imply higher levels of financial sophistication and investor competence, therefore, increasing financial market participation (Cole et al., 2012). In turn, we expect higher levels of education to be associated with lower levels of home bias in equity markets.

In addition to education, which is our core explanatory variable, we include in vector *X* a set of control variables that have been found to explain portfolio diversification in previous studies. We categorise these variables into six groups[8]:

3.1.1. Macro-economic conditions

We begin by using the growth in *Gross Domestic Product* (*GDP*).[9] GDP growth can have both positive and negative impacts on home bias. Countries with fast growing GDP should attract more foreign investments resulting in a decline in the home bias. On the other hand, countries growing faster are mostly the emerging market economies that face higher risk, thus, discouraging foreign investments, resulting in an increase in home bias.

Foreign direct investment (*FDI*) was employed by Chan et al. (2005) as another measure of economic development. It is measured by net inflows of foreign direct stock investment, scaled by GDP. An increase in FDI should have a negative effect on home bias (Chan et al., 2005). This indicator is important as a country's level of economic development is likely to affect the flow of foreign investments in a country.

3.1.2. Information-related variables

Following De Moor and Vanpée (2013), trade and the English legal origin are taken as proxies for information asymmetries and familiarity, respectively. *Trade* is calculated as the average of exports and imports scaled by GDP. The *English legal origin* is a dummy variable that takes the value one if the country has English common law as the legal origin, and zero otherwise. La Porta et al. (2008) showed that a country's legal origins have a statistically large impact on investor protection which is associated with improved financial development and access to finance, thus reducing equity home bias. Therefore, both trade and English legal origin are expected to affect home bias negatively.

Labour force size is likely to influence individuals' investment decisions by affecting their risk preferences. It is measured by the total population in the age group of 15 and older who are economically active. Several researchers concluded that older investors are more experienced, practiced and more likely to diversify their investment portfolios. Hence, labour force size and home bias should be negatively correlated, which means that as individuals are economically more active, their level of income and diversification increases (Goetzmann and Kumar, 2003).

3.1.3. Financial liberalisation

Following Mondria and Wu (2010), the *Chinn-Ito Index of financial openness* is used to measure financial liberalisation and financial openness at the country level. Financial market openness provides incentive for investors to hold foreign assets in order to increase gains from diversification. Thus, financial openness of a country is likely to affect home bias negatively. This measure is a combination of four binary dummy variables mentioned in IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). The variables include the presence of multiple exchange rates, the existence of restrictions on current account transactions, the existence of restrictions on capital account transactions and the requirement to surrender of the proceeds of exports. Hence, by structure the Chinn-ito index is a de-jure measure of financial openness as it attempts to measure regulatory restrictions on capital account transactions.[10]

3.1.4. Financial market development

Using turnover ratio, domestic credit and stock market capitalisation, we measure the impact of financial market development on equity home bias. We expect to find a negative relation between these variables and equity home bias. *Market turnover*, which is measured by the turnover ratio, shows an asset's ability to be sold without causing much movement in price and value. Following Levine and Zervos (1996), the turnover ratio helps in measuring market liquidity and transaction costs.[11] According to Bekaert et al. (2007), the effect of liquidity is more distinct in emerging markets where executing transactions are time-consuming.

---

[7] Note that Education in Finance, which was an alternative variable of financial education used in Jappelli (2010), was not available to us. The data-set in the present study was downloaded in August 2013 and this particular data item was removed from the database.

[8] We have also experimented with the corruption index, as an additional control variable to deal with the concept of governance. This variable, however, proved to be highly co-linear with both financial skills and PISA scores as well as with financial openness. We have opted therefore, not to include this variable in our specifications.

[9] We also use the log of GDP per capita as a measure of economic development and our results are broadly similar. However, the variable has high correlation with PISA scores, tertiary education and financial openness. Thus, this variable is not included in the main models.

[10] One potential drawback of this index is that investors may find loopholes and thus may escape the capital account restrictions, invalidating the effect of capital account restrictions.

[11] It is shown that assets with lower liquidity, trade at a lower price relative to their expected cash flows. Thus, illiquid assets command a higher risk premium and therefore higher expected returns.

Domestic credit provided by the banking sector, as a percentage of GDP, was used by Rose and Spiegel (2009) and De Moor and Vanpée (2013) to measure the domestic financial depth. This variable includes all credit to various sectors on a gross basis, with the exception of credit to the central government, which is net.[12]

Market capitalisation, as a percentage of GDP, measures the share price times the number of shares outstanding. This is an efficient measure of stock market size. According to Chan et al. (2005), larger stock markets are more visible, more recognised and more developed, and therefore are able to attract more foreign equity portfolio investment. Thus, home bias in a country is likely to decrease with an improvement in a country's financial depth and liquidity.

3.1.5. Diversification benefits and financial factors

Following Edison and Warnock (2004), we employ the *current ratio* that signals the ability of firms to meet short-term obligations. This ratio is calculated as current assets over current liabilities. Thus, an increase in current ratio should have a negative impact on home bias as firms which are more liquid are able to attract higher levels of foreign investments, thus reducing the home bias.

In addition, we use *Leverage*, which is calculated as the ratio of total debt to total assets. More indebted companies face a higher degree of information asymmetries and are associated with a weaker financial position. These companies are less likely to attract foreign investors which minimises their diversification benefits and therefore the higher the leverage, the higher the home bias.

3.1.6. Foreign exchange risk

Following De Moor and Vanpée (2013), we account for foreign exchange rate risk by creating a dummy (*Euro*), which takes the value one if the country is a member of the Euro-area, and zero otherwise. Baele et al. (2007) found that home bias was lower for the countries that were a part of the European monetary union compared to other countries. Thus, foreign exchange risk is expected to have a positive effect on home bias.

3.2. The impact of financial development

In the next stage, we explore the extent to which different levels of education may have an impact on the home bias of countries characterised by different degrees of financial development. To do so, we use the degree of stock market capitalisation as a sorting device. Larger stock markets are considered to have higher mobility of capital, less volatility and risk and are more internationally integrated (Demirguc-Kunt and Levine, 1996). Further, investors are attracted towards more developed stock markets due to the fact that they are characterised by lower transaction costs and higher liquidity (Chan et al., 2005). The countries in our sample are classified into more and less financially developed on the basis of the average stock market capitalisation normalised by GDP[13] using the dummy *Fin.Dev*. This implies that countries above (below) the mean of stock market capitalisation are more (less) financially developed. As the degree of home bias in international portfolios is higher in less financially developed economies, the impact of education and financial sophistication on home bias is expected to be more important in countries with less developed financial markets compared to their more developed counterparts. In order to test this hypothesis, we modify Eq. (1), by including interactions between education (*Edu*) and the financial development dummy (*Fin.Dev*).

$$EHB_{it} = a_0 + a_1 Edu_{it} * Fin.Dev_{it} + a_2 Edu_{it} * (1 - Fin.Dev_{it}) + a_3 Fin.Dev_{it} + a_4 X_{it} + e_{it}, \quad (3)$$

The specifications above capture the impact of education on economies with different levels of financial development. If the interacted coefficients are statistically different from each other it can be concluded that the impact of education on the home bias is different between more and less financially developed economies.

3.3. Accounting for differences between crisis and non-crisis periods

Having identified a relationship between different facets of education and home bias for more and less financially developed economies, we then explore whether this linkage has evolved over time. Our sample covers the most recent global financial crisis and it provides an interesting setup to investigate the extent to which, controlling for other factors, home bias differs in crisis years compared to more tranquil periods. Therefore, we augment Eq. (3) with a financial crisis dummy (*Crisis*), which takes the value one over the period 2007–2010, and zero otherwise. We then interact the education variable with the *Crisis* and the *Fin.Dev* dummies to examine whether the sensitivity of countries' home bias to different levels of education differs between crisis and non-crisis periods for more and less financially developed economies. There is evidence that the most recent financial crisis adversely influenced equity markets in the world: countries with poor credit market regulations

[12] The banking sector includes monetary authorities and deposit money banks, as well as other banking institutions where data are available.

[13] In the robustness tests section we present results when we employ the ratio of total value of stock traded to gross domestic product as an alternative sorting device for financial development. In addition, we found that our results are upheld when other measures are used such as the mean of stock market capitalisation and outstanding domestic private debt securities to gross domestic product (GDP).

and larger pre-crisis current account deficits were hit the hardest (Giannone et al., 2010; Lane and Milesi-Ferretti, 2011). The estimated model is described as follows:

$$EHB_{it} = a_0 + a_1 Edu_{it} * Fin.Dev_{it} * Crisis_t + a_2 Edu_{it} * (1 - Fin.Dev_{it}) * Crisis_t + a_3 Edu_{it} * Fin.Dev_{it} * (1 - Crisis_t) + a_4 Edu_{it} * (1 - Fin.Dev_{it}) * (1 - Crisis_t) + a_5 Fin.Dev_{it} + a_6 X_{it} + e_{it}, \quad (4)$$

If the interaction terms during the crisis are significantly different from the same terms outside of the crisis, then the additional response of the home bias to education during the crisis is detectable compared to tranquil periods.

4. Data and summary statistics

4.1. Data

The data for this paper are drawn from different sources including the Coordinated Portfolio Investment Survey (CPIS), the World Development Indicator (hereafter WDI) of the World Bank, the IMD World Competitiveness Yearbook (WCY), the World Federation of Exchanges (WFE) and the DataStream. These are combined in a new way to demonstrate the effect of education on international diversification in equity portfolios. The data-set covers 38 countries over the period of 2001–2010.[14]

4.1.1. Home bias measure

Portfolio holdings data for constructing the equity home bias measure are taken from Coordinated Portfolio Investment Survey (CPIS) held by the IMF. This survey contains comparable multi-country data at the security level from end-investors, custodians and a combination of the above. Portfolio investment is broken down by instrument (equity) and residence of issuer.[15] The equity market capitalisation data are from the World Federation of Exchanges (WFE).

4.1.2. Education

In our study, we measure education using traditional indicators such as tertiary school enrolment rates, mathematical literacy and financial skills. Tertiary enrolment rates are drawn from the WDI of the World Bank. As an alternative measure of education we employ the PISA maths scores for 15 year old individuals. This is a good proxy for economic literacy as it provides an assessment of financial knowledge and skills (Jappelli, 2010). This variable can also be a good measure to capture the numerical ability as the propensity to invest is related with numerical ability, verbal fluency and recall skills (Christelis et al., 2010). Finally, this variable allows us to capture financial literacy among young people, which has been highlighted as an important factor at the beginning of individuals' working life (see Jappelli, 2010; Lusardi and Micthell, 2014). In addition to these variables, we use an indicator of financial skills drawn from the IMD World Competiveness Yearbook (WCY). This indicator is based on a survey conducted on senior business managers who represent a cross-section of the business community in the countries examined. The survey tries to answer questions related to efficiency and ability of managers to adapt towards changing enterprise competitiveness. WCY also reports questions related to value added activities in business, since skilled labour force is able to enhance a country's competitiveness. The distribution and ranking of economies in the survey carried out by WCY is very similar to those provided by the Survey of Health, Assets, Retirement and Expectations (SHARE), which gives information on the cognitive ability at the individual level in 11 European countries (see Jappelli, 2010; Jappelli and Padula, 2013). Thus, WCY can provide a representative base for conducting our empirical analysis.

4.1.3. Other influences

Data on GDP growth, foreign direct investment (FDI), trade and labour force size are taken from the WDI of the World Bank. Turnover ratio, domestic credit and stock market capitalisation data are also sourced from the WDI of the World Bank. Finally, data on leverage and current ratio are obtained from the DataStream Global Index. DataStream, which is distributed by Thomson Reuters, is a global financial and macroeconomic database for equities, stock market indices, currencies, company fundamentals and fixed income securities.

[14] Due to missing information in the CPIS dataset for India and Mexico, the home bias data for these countries begin in 2003. We have selected a data-set which is comparable to De Moor and Vanpée (2013) with the exception of Canada, Germany, Singapore and South Africa that suffer from missing data on the education variables. In line with the literature, we do not remove outliers from the chosen variables, but in unreported regressions we find that even after dropping outliers from the equity home bias term and the regression variables, our results remain unchanged. These results are not reported but are available from the authors upon request.

[15] The CPIS provides the most comprehensive survey of international portfolio investment holdings and has been employed by a number of recent studies (e.g. Fidora et al., 2007; Bekaert and Wang, 2009; Giannetti and Koskinen, 2010). However, it is still subject to a number of important caveats such as incomplete country coverage (see De Moor and Vanpée, 2013). For general information about the database see http://www.imf.org/external/data.htm#financial.

Table 1
Summary statistics for the explanatory variables.

Variables	(1) Whole sample	(2) Fin.Dev	(3) (1 – Fin.Dev)	(4) *p*-value
Average equity home bias (%)	77.12	68.70	82.13	0.000
	(21.10)	(18.44)	(21.03)	
Tertiary education	55.38	60.87	52.05	0.000
	(20.96)	(16.55)	(22.63)	
PISA	480.34	506.55	464.17	0.000
	(51.25)	(34.60)	(52.81)	
Financial skills	65.51	71.82	61.67	0.000
	(10.35)	(7.85)	(9.80)	
GDP growth	2.91	2.37	3.22	0.011
	(3.43)	(2.71)	(3.76)	
FDI	3.96	4.97	3.37	0.014
	(6.18)	(6.09)	(6.17)	
Trade	82.30	96.62	73.94	0.004
	(60.43)	(86.36)	(35.55)	
Labour force size	36.90	25.47	43.57	0.007
	(76.02)	(39.42)	(90.22)	
English legal origin	0.24	0.43	0.13	0.000
	(0.43)	(0.50)	(0.33)	
Financial openness	1.42	2.12	1.01	0.000
	(1.31)	(0.74)	(1.40)	
Turnover ratio	82.18	106.50	67.82	0.000
	(61.27)	(62.60)	(55.81)	
Domestic credit	107.43	151.10	81.72	0.000
	(62.80)	(64.01)	(45.58)	
Market capitalisation	77.65	135.03	43.91	0.000
	(75.35)	(95.08)	(25.30)	
Current ratio	4.23	4.12	4.30	0.919
	(16.73)	(15.41)	(17.53)	
Leverage	36.43	35.55	36.96	0.122
	(8.64)	(8.20)	(8.88)	
Euro	0.24	0.29	0.21	0.097
	(0.46)	(0.45)	(0.41)	
No. of observations	375	140	235	

Note: The table presents sample means with standard deviations in parentheses. The *p*-value of a test of equality of means with unequal variances is reported. Fin.Dev is a dummy which takes the value one if a country's stock market capitalisation is higher than the average, and zero otherwise.

4.2. Summary statistics

By way of preliminary analysis we present descriptive statistics for equity home bias and the country-specific variables used in the regression models in Table 1. We report these values for the whole sample (column 1); for more and less financially developed economies (columns 2 and 3); and a *p*-value for the test of equality of means with unequal variances (column 4). To begin with the average home bias for the whole sample takes the value 77.12% for equity portfolios. The statistics also show that in all countries equity portfolios exhibit home bias, with the highest average equity home bias observed in Turkey during the period of 2001–2010 and the lowest average equity home bias occurs in the United States.[16]

Further, in columns 2 and 3 we find that home bias is more prevalent in less financially developed economies. We show that the average equity home bias in the more financially developed economies is 68.70%, while that for the less developed economies is 82.13%. Put differently, investors in the less financially developed economies hold less than 1/5th of foreign equities that they should be holding according to the basic international CAPM model. This supports the notion put forward by Coeurdacier and Rey (2013) that home bias in equities is likely to be more important in economies with less developed financial markets.[17] In addition, Sercu and Vanpée (2007) point out that emerging market economies have more volatile stock markets and hence display higher equity home bias. They argue that international investors are reluctant to invest in these economies due to higher risk and volatility.

We observe that all measures of education are significantly higher for the developed group, as expected. Variables reflecting macro-economic conditions such as GDP growth and FDI display significantly different values for the two groups of countries.[18] Specifically, less financially developed economies are growing faster compared to their more developed

[16] See Table A.2 in appendix for statistics on the home bias across the countries employed in this paper.
[17] Coeurdacier and Rey (2013) show that emerging markets have less diversification in their equity portfolios than developed economies and do not display any downward trend in home bias.
[18] Table A.2 also provides the average of different measures of education for 2001–2010 across countries.

counterparts, while the level of FDI is higher for the more developed group as opposed to the less developed group. With respect to information-related variables, we observe that trade, labour force size and the English legal origin dummy have significant differences across the two groups of countries. More financially developed countries have a higher level of trade and most have English as their legal origin compared to less developed economies. We also observe that labour force size is larger for more financially developed countries compared to less developed countries. This statistic is mainly influenced by India which has the largest labour force amongst the less developed countries. Financial openness is significantly higher for economies with more financially developed markets as opposed to less developed economies. Moving to financial market indicators, we find that turnover ratio, domestic credit and market capitalisation are larger for the developed countries and are also significantly different from the less developed group. In addition, while less developed economies display higher current ratios and levels of debts, the differences are not statistically significant. Finally, the mean of the Euro dummy is higher for more financially developed economies and also significantly different from the less developed group.

Taken together, two points can be highlighted from these preliminary statistics. First, equity portfolios are significantly home-biased in our sample. Second, more financially developed economies enjoy an advantageous position in attracting foreign investments, display higher levels of education, stronger economic and financial factors, financial market liberalisation and lower exchange rate risk than less financially developed economies. It remains to be seen, though, whether these preliminary findings continue to hold when we control for a number of factors which are known to play a role in international diversification studies. In the sections that follow we test within a formal regression analysis framework whether education has a statistically significant influence on equity home bias.

5. Results

5.1. Education and home bias in equity portfolios

In this section we shed light on the role played by education in equity portfolios. We report parameter estimates obtained from OLS and instrumental variables (IV) regressions.[19]

IV methods rely on two assumptions. The first is that the excluded instruments are distributed independently of the error process, and the second, that they are sufficiently correlated with the included endogenous regressors. We propose that primary education enrolment rates and unemployment rates (percentage of total labour force) can provide plausible exogenous source of variations in the level of education.[20] In addition, both instruments are expected to affect education and numeracy but they do not impact the degree of diversification directly. We also assume that all the other control variables used in the model are possibly endogenous. Thus, we instrument for these variables using their own values lagged twice. Lags of the variables are legitimate candidates since they contain information about the current values of the potentially endogenous variables and remain uncorrelated with the current value of the measurement error (see Almeida et al., 2010).[21] We check the relevance and validity of the instruments used for education as well as for our control variables employing a number of diagnostics. *p*-values for these tests are reported at the foot of the tables.

We report OLS estimates of equity home bias for different measures of education in columns 1–3 and IV estimates in columns 4–6 of Table 2.[22] We begin with tertiary education in column 1 and then add PISA math scores and financial skills in subsequent columns. The point estimates on education suggest a robust relationship between the different measures of education and the home bias for equity portfolios. Education attracts a negative and highly significant coefficient for all the three measures, which enables us to assess the impact of a ceteris paribus increase in education on the degree of equity home bias. Our finding suggests that increasing the percentage of university graduates or the level of mathematical numeracy is likely to reduce the level of home bias. This finding is not only statistically but also economically important. To ascertain its magnitude, we calculate percentage point effects by dividing the coefficient value (marginal effect) with the predicted probability of the model. Therefore, a 10% increase in *tertiary education* graduates leads to a 3.39% reduction in home bias.[23] An identical increase in *PISA* scores and *financial skills* will drop equity home bias by 1.24% and 7.22%, respectively.[24] The IV results show similar magnitudes for tertiary education and PISA scores. A 10% increase in *tertiary education* and *PISA* scores reduces home bias by 6.09% and 2.57%, respectively. On the other hand, *financial skills* do not exert a significant impact on equity home bias indicating that the previous finding might be subject to endogeneity bias not controlled for in the OLS

[19] We show the first stage IV estimates and statistics in Table A.3.

[20] We present scatter plots with best-fitting regression lines in Fig. A.1 to document the strong relationship between equity home bias and tertiary education, mathematical numeracy and financial skills. On the other hand, the scatter plot shows a weak relationship between equity home bias and primary education with a very low correlation coefficient (0.13).

[21] Following the bulk of the literature on firm-level behaviour, we instrument financial variables such as turnover ratio, trade, market capitalisation, current ratio, domestic credit and leverage using their own values lagged two times.

[22] Results obtained by Seemingly Unrelated Regression (SUR) method are quantitatively similar to the OLS results implying that the error terms are uncorrelated.

[23] As noted above, these percentage effects are calculated based on the ratio of the coefficient to the predicted probability of the model. More specifically, in column 1 the point estimate of -0.260 is divided by the predicted probability of 76.81 and then multiplied by 10.

[24] Note that the effect of financial skills is of a bigger magnitude compared to PISA scores.

Table 2
Baseline model for the equity home bias.

Main measure	Dependent variable = Equity home bias					
	(1) OLS Tertiary education	(2) OLS PISA	(3) OLS Financial skills	(4) IV Tertiary education	(5) IV PISA	(6) IV Financial skills
Education	−0.260**	−0.091**	−0.554**	−0.470**	−0.186*	0.340
	(−2.45)	(−2.05)	(−2.63)	(−2.22)	(−1.79)	(0.92)
GDP growth	0.562*	0.085	0.586	−0.642	−0.283	−0.287
	(1.72)	(0.34)	(1.38)	(−1.49)	(−0.99)	(−1.04)
FDI	−0.288	−0.145	−0.172	−0.232	−0.231	0.001
	(−1.22)	(−0.90)	(−1.24)	(−0.84)	(−1.11)	(0.00)
Trade	−0.015	−0.033	−0.023	−0.164	−0.056	0.050
	(−0.38)	(−0.42)	(−0.35)	(−1.59)	(−0.46)	(0.59)
Labour force size	−0.021	−0.033	−0.007	−0.135***	−0.197***	−0.137
	(−0.92)	(−0.49)	(−0.14)	(−2.60)	(−2.77)	(−1.34)
English legal origin	−11.277**	1.499	−2.396	1.281	24.135	8.562
	(−2.08)	(0.34)	(−0.52)	(0.13)	(1.52)	(0.61)
Financial openness	−4.341**	−7.420**	−8.477***	0.966	6.390	−3.971
	(−2.46)	(−2.68)	(−4.34)	(0.35)	(1.28)	(−1.62)
Turnover ratio	0.004	0.017	−0.009	0.068	0.008	−0.001
	(0.13)	(0.53)	(−0.37)	(1.59)	(0.23)	(−0.05)
Domestic credit	−0.089**	−0.154***	−0.122**	−0.211***	−0.194***	−0.207***
	(−2.11)	(−2.96)	(−2.39)	(−3.98)	(−4.01)	(−4.61)
Market capitalisation	0.037	0.021	0.020	0.092	−0.005	−0.052
	(0.93)	(0.68)	(0.80)	(1.55)	(−0.08)	(−0.84)
Fin.Dev	4.946	2.899	7.497	−7.241	−8.919	5.120
	(0.81)	(0.40)	(1.08)	(−0.60)	(−0.56)	(0.36)
Current ratio	−0.038	−0.056**	−0.033	−0.221	−0.200*	−0.094
	(−1.54)	(−2.24)	(−0.91)	(−1.39)	(−1.80)	(−0.94)
Leverage	−0.015	0.213	0.268	−0.044	−0.076	0.048
	(−0.07)	(0.69)	(1.07)	(−0.26)	(−0.30)	(0.23)
Euro	−16.704**	−3.842	−6.705	−16.147***	−15.952***	−29.129***
	(−2.40)	(−0.47)	(−1.04)	(−3.39)	(−4.61)	(−2.97)
Constant	112.797***	136.313***	126.294***	133.848***	181.252***	78.735***
	(11.36)	(5.64)	(8.24)	(15.43)	(4.49)	(3.77)
Predicted probability	76.81	73.24	76.78	77.12	72.47	76.30
N	345	244	349	320	222	316
R^2	0.79	0.78	0.81	0.91	0.91	0.91
Kleibergen–Paap	–	–	–	0.031	0.060	0.032
Anderson–Rubin	–	–	–	0.000	0.000	0.000
Stock–Wright	–	–	–	0.000	0.004	0.000
Hansen *J*	–	–	–	0.551	0.621	0.854

Note: Columns 1–3 report OLS regression results, while columns 4–6 report IV (2SLS) regression results. Robust *t*-statistics (OLS) and *z*-statistics (IV) are reported in the parentheses. Statistical significance is denoted at 1% (***), 5% (**) and 10% (*). Time dummies and country dummies are included in the specifications. The standard errors are adjusted for clustering at the country-level. In the IV regressions the main measures of education are instrumented using the percentage of individuals with primary education and unemployment rates, while the other control variables are instrumented using their lagged levels at $t-2$. The Kleibergen–Paap is a test of under-identification, distributed as chi-square under the null of under-identification. The Anderson–Rubin and Stock–Wright LM S statistic are weak-instrument-robust inference tests, which are distributed as *F*-test and chi-square respectively, under the null that coefficients of the endogenous regressors in the structural equation are jointly equal to zero, and the over-identifying restrictions are valid. Hansen J statistic is a test of the over-identifying restrictions, distributed as chi-square under the null of instrument validity.

estimates. Overall, these results which highlight the effect of education on equity home bias are in line with Cole et al. (2012) and Graham et al. (2009), who show that financial market participation increases if the education attained at the school level improves. Importantly, our results also confirm the findings of Karlsson and Nordén (2007) that higher levels of education are associated with lower equity home bias.

Next, we focus on the country-specific control variables used in the models.[25] We find that the coefficients on *GDP* growth and *FDI* are statistically insignificant with some marginal evidence that fast growing countries display a higher level of equity home bias. With respect to information-related variables, we find that *trade* enters with a negative but insignificant coefficient in the equity home bias regression. Both *labour force size* and the *English legal origin* dummy, when significant, enter with the expected negative coefficients. The former finding implies that greater participation in labour force is likely to have a positive impact on foreign portfolio diversification. The latter finding shows that countries that have English common law as their legal origin display lower levels of home bias as the investor and shareholder protection aspect of the legal origin helps in financial market development (La Porta et al., 2008).

[25] Table A.4 provides the correlation matrix between all the explanatory variables which show that our variables do not suffer from high correlation.

Financial openness enters with the anticipated negative sign and is highly significant in all models estimated via OLS. This result shows that an increase in a country's financial openness is likely to reduce the equity home bias. This finding is in line with Bekaert and Wang (2009) and Mondria and Wu (2013). While, *turnover ratio* is insignificant, we observe a negative and highly statistically significant coefficient for *domestic credit* which is a measure of financial depth. This suggests that an improvement in a country's liquidity and expansion of financial markets helps to attract more foreign investment, resulting in a negative relation with equity home bias.

Current ratio attains the expected negative sign, while *leverage* is quantitatively unimportant. Firms with a higher current ratio are in better financial shape and can attract more foreign investments (Edison and Warnock, 2004). Thus, an increase in foreign investments tends to reduce equity home bias. The coefficient on the *Euro dummy* is consistently negative and highly significant. The point estimates indicate that countries within the Euro-area have lower home bias in equity portfolios as shown by De Moor and Vanpée (2013). This result implies that countries with a common currency such as the Eurozone countries experience lower home bias in terms of equities (Baele et al., 2007). Lastly, both the financial development dummy and stock market capitalisation are generally insignificant. Regarding the IV diagnostics, the Kleibergen–Paap statistics reject the null hypothesis that the equation is underidentified. The Anderson–Rubin and Stock–Wright statistics, which are the weak instrument-robust inference tests, do not reject the null hypothesis that the coefficients of the excluded instruments are jointly equal to zero. Finally, the Hansen *J* statistic of the overidentifying restriction also shows that the instruments are valid.[26]

5.2. Accounting for different levels of financial development

Having identified a direct relationship between education and home bias, we now explore whether this link varies for countries with different levels of financial market development. Table 3 presents estimates for the interaction terms between education and *Fin.Dev* and (1 − *Fin.Dev*) dummies. The results reveal the heterogeneity between countries that is masked in the estimates for the full sample.

We report parameter estimates in Table 3. The coefficients associated with the interaction terms are negative and significant for the less financially developed countries, while they are quantitatively unimportant for their developed counterparts. In other words, we find that improving education is likely to decrease the level of home bias for less financially developed economies. The magnitude of the interacted coefficients suggests an economically meaningful result. Specifically, a 10% increase in *tertiary education* and *PISA scores* will reduce home bias in less developed economies by 6.39% and 1.99%, respectively. The IV results show that a 10% increase in *tertiary education* and *PISA scores* will reduce home bias in less developed economies by 5.52% and 3.97%, respectively.[27]

To put it differently, we find that countries which are characterised by less developed financial markets exhibit a higher sensitivity of equity home bias to education. Tests of equality for the education coefficients between the two groups of countries indicate that the null hypothesis of equality can be rejected in all regression models. This is a novel finding which highlights that education has a differentiated effect in determining equity home bias in economies with less developed financial sector. Hence, it suggests that an increase in the percentage of University graduates and an improvement in mathematical numeracy in economies that display a lower level of equity market development can be a crucial factor in reducing equity home bias. Specifically, an increase in the level of education helps in strengthening the investor's competence that, in turn, encourages the investor to diversify his/her portfolio in terms of foreign investments. Lastly, with respect to the other control variables in the model, they retain their significance in most cases and behave as conjectured.

5.3. The effect of the most recent financial crisis

Our sample spans the most recent global financial crisis and as such it provides an interesting set-up to explore the impact of the crisis on portfolio diversification. We address the response to the crisis by examining the sensitivity of home bias to education in the 2007–2010 financial crisis. We report coefficients on variables interacted with the dummy variables *Crisis* and (1 − *Crisis*) along with the dummies (*Fin.Dev*) and (1 − *Fin.Dev*).

The results reported in Table 4 show the impact of the equity home bias in more and less financially developed economies during crisis and non-crisis periods. To begin with, the coefficients on the interaction terms are negative and significant for less financially developed economies in both crisis and non-crisis periods. The results imply that education plays a more important role in reducing the equity home bias in economies with lower levels of equity market development during the crisis and non-crisis periods compared to more financially advanced economies.

In terms of economic significance, the coefficient values imply important differences. In particular, during the crisis period, a 10% increase in *tertiary education* and *PISA scores* will lead to a reduction in the equity home bias of less financially

[26] In addition to the statistics reported at the tables of results, we also employed the Anderson Rubin chi-square test and obtained identical *p*-values with the Anderson Rubin *F*-test.

[27] The estimated coefficients on *financial skills* do not show any statistically significant impact on equity home bias when we split our countries on the basis of their financial development. One potential explanation for this finding might be the fact that financial skills are widespread across both developed and developing economies and we are unable to detect any heterogeneity.

Table 3
Accounting for different levels of financial development.

Main measure	Dependent variable = Equity home bias					
	(1) OLS Tertiary education	(2) OLS PISA	(3) OLS Financial skills	(4) IV Tertiary education	(5) IV PISA	(6) IV Financial skills
Edu ∗ (Fin.Dev)	0.164	−0.002	−0.054	0.297	−0.006	0.664
	(1.23)	(−0.04)	(−0.27)	(1.11)	(−0.07)	(1.06)
Edu ∗ (1 − Fin.Dev)	−0.491***	−0.146***	−0.135	−0.424**	−0.287*	−0.612
	(−4.96)	(−2.99)	(−0.89)	(−2.15)	(−1.81)	(−1.62)
GDP growth	0.073	−0.049	0.063	0.803	−0.291	−0.115
	(0.46)	(−0.22)	(0.41)	(1.16)	(−0.68)	(−0.38)
FDI	−0.095	−0.070	−0.115	0.062	0.180	0.160
	(−1.03)	(−0.81)	(−1.09)	(0.41)	(1.51)	(1.10)
Trade	0.002	0.010	0.025	−0.105	−0.161**	−0.184***
	(0.03)	(0.18)	(0.45)	(−0.76)	(−2.01)	(−2.79)
Labour force size	−0.116***	−0.088*	−0.024	−0.121**	−0.455	0.061
	(−3.23)	(−1.81)	(−0.45)	(−2.20)	(−1.10)	(0.17)
English legal origin	7.587	10.640**	4.530	−4.797	8.373	−0.910
	(1.67)	(2.31)	(1.13)	(−0.76)	(1.35)	(−0.14)
Financial openness	−2.187	−0.762	−5.434***	3.629	0.014	1.340
	(−1.23)	(−0.34)	(−3.88)	(1.41)	(0.50)	(0.51)
Turnover ratio	−0.017	0.021	−0.004	−0.019	−0.153**	0.022
	(−1.28)	(1.01)	(−0.22)	(−0.92)	(−2.46)	(1.16)
Domestic credit	−0.151***	−0.191***	−0.185***	−0.185***	−142.671**	−0.138**
	(−4.78)	(−5.92)	(−6.60)	(−3.84)	(−2.02)	(−2.48)
Market capitalisation	0.021	0.019	0.009	0.052	0.006	−0.002
	(0.67)	(0.79)	(0.33)	(1.62)	(0.23)	(−0.03)
Fin.Dev	−44.986***	−78.045**	−6.863	−47.950**	−0.013	−96.912*
	(−2.81)	(−2.69)	(−0.47)	(−2.26)	(−0.51)	(−1.74)
Current ratio	−0.047**	−0.053***	−0.047*	0.007	0.082	−0.030
	(−2.61)	(−3.13)	(−1.85)	(0.15)	(0.26)	(−1.33)
Leverage	0.063	0.240	0.181	−0.004	−15.134	0.197
	(0.41)	(0.82)	(0.93)	(−0.03)	(−1.58)	(1.36)
Euro	−23.910***	−21.157***	−20.057***	−30.889***	13.635	−12.480***
	(−5.53)	(−5.33)	(−5.44)	(−2.91)	(1.04)	(−4.10)
Constant	123.960***	157.847***	105.284***	121.926***	229.238***	137.907***
	(13.65)	(6.80)	(8.13)	(12.15)	(3.56)	(5.73)
Predicted probability	76.89	73.24	76.83	76.85	72.21	77.02
N	345	244	349	321	230	315
R^2	0.92	0.92	0.90	0.92	0.904	0.87
Test of equality (*p*. value): Edu	0.002	0.020	0.682	0.043	0.062	0.095
Kleibergen–Paap	–	–	–	0.095	0.011	0.075
Anderson–Rubin	–	–	–	0.000	0.000	0.000
Stock–Wright	–	–	–	0.000	0.000	0.000
Hansen *J*	–	–	–	0.348	0.163	0.118

Note: Statistical significance is denoted at 1% (***), 5% (**) and 10% (*). The *p*-value refers to the test of equality between Edu ∗ Fin.Dev and Edu ∗ (1 − Fin.Dev). Also, see notes to Table 2.

developed economies by 6.36% and 3.09%, respectively. In tranquil periods, an identical increase in *tertiary education* and *PISA scores* will drop the equity home bias in less developed economies by 6.32% and 2.66%, respectively. The IV estimates show similar magnitudes. During the crisis period, a 10% increase in *tertiary education* and *PISA scores* will lead to a reduction in the equity home bias of less financially developed economies by 6.88% and 3.78%, respectively. In non-crisis periods, an identical increase in *tertiary education* and *PISA scores* will drop the equity home bias in less developed economies by 6.47% and 3.31%, respectively. The test of equality of the coefficients, which is reported at the foot of the table, shows a statistically significant difference between the above-mentioned coefficients.

In summary, the greater sensitivities of equity home bias to changes in the level of education are documented for economies which exhibit lower levels of financial development during the crisis than outside. According to Eichengreen et al. (2006), during adverse economic events foreign investors tend to escape emerging markets because these are characterised by lower liquidity, higher volatility and domestic risk. This finding was also noted in Mizen and Tsoukas (2012), who documented a substantial increase in the bond market external finance premium for the emerging Asian markets. This results in lower levels of foreign investments and higher degree of home bias in emerging markets. Thus, our finding suggests that having more university graduates, or a higher level of mathematical numeracy, reduces the extent of local equity home bias during the crisis, especially in less developed economies. This could be one important factor in ameliorating the adverse effects of financial crises with respect to international diversification.

Table 4
The role of the recent financial crisis.

Main measure	Dependent variable = Equity home bias					
	(1) OLS Tertiary education	(2) OLS PISA	(3) OLS Financial skills	(4) IV Tertiary education	(5) IV PISA	(6) IV Financial skills
Edu ∗ Crisis ∗ Fin.Dev	0.162	−0.015	−0.004	0.004	0.010	0.940
	(1.20)	(−0.17)	(−0.02)	(0.02)	(0.09)	(1.33)
Edu ∗ Crisis ∗ (1 − Fin.Dev)	−0.489***	−0.226**	−0.198	−0.530***	−0.276***	−0.702
	(−4.87)	(−2.36)	(−1.19)	(−3.11)	(−2.83)	(−1.57)
Edu ∗ (1 − Crisis) ∗ Fin.Dev	0.156	0.003	−0.002	0.022	0.028	0.873
	(1.03)	(0.04)	(−0.01)	(0.09)	(0.24)	(1.25)
Edu ∗ (1 − Crisis) ∗ (1 − Fin.Dev)	−0.486***	−0.195**	−0.154	−0.498**	−0.242***	−0.608
	(−4.50)	(−2.22)	(−0.99)	(−2.31)	(−2.65)	(−1.44)
GDP growth	0.073	−0.043	0.052	0.162	0.026	−0.094
	(0.44)	(−0.24)	(0.34)	(0.77)	(0.11)	(−0.28)
FDI	−0.096	−0.091	−0.115	0.173	0.033	0.157
	(−1.06)	(−0.78)	(−1.12)	(1.53)	(0.28)	(1.15)
Trade	0.001	−0.059	0.018	−0.303***	−0.066	−0.191***
	(0.02)	(−1.02)	(0.32)	(−4.20)	(−1.24)	(−3.06)
Labour force size	−0.115***	−0.114*	−0.027	−0.287***	−0.203**	−0.009
	(−3.13)	(−1.81)	(−0.51)	(−2.97)	(−2.22)	(−0.02)
English legal origin	7.709	6.333	4.713	−7.176	−7.016	−0.143
	(1.66)	(0.82)	(1.15)	(−1.21)	(−0.51)	(−0.02)
Financial openness	−2.167	3.074	−5.324***	4.783**	6.503**	1.816
	(−1.20)	(0.82)	(−3.71)	(2.14)	(2.10)	(0.69)
Turnover ratio	−0.017	0.007	−0.004	0.004	0.003	0.015
	(−1.27)	(0.22)	(−0.26)	(0.14)	(0.09)	(0.64)
Domestic credit	−0.153***	−0.187***	−0.181***	−0.103**	−0.138***	−0.164**
	(−5.10)	(−4.49)	(−6.61)	(−2.13)	(−2.82)	(−2.54)
Market capitalisation	0.022	0.065	0.011	0.053	0.057	−0.010
	(0.70)	(1.37)	(0.38)	(1.53)	(1.25)	(−0.13)
Fin.Dev	−44.490***	−108.207**	−13.825	−38.460**	−136.078**	−115.796*
	(−2.73)	(−2.20)	(−0.90)	(−2.24)	(−2.45)	(−1.90)
Current ratio	−0.047**	−0.039**	−0.044*	−0.016	−0.034	−0.012
	(−2.55)	(−2.68)	(−1.92)	(−0.53)	(−1.49)	(−0.52)
Leverage	0.063	0.082	0.156	−0.213	0.378	0.122
	(0.37)	(0.34)	(0.76)	(−0.90)	(1.46)	(0.69)
Euro	−23.805***	−14.827**	−19.623***	−23.810***	−27.476***	−11.273***
	(−5.62)	(−2.39)	(−5.05)	(−2.85)	(−2.98)	(−3.56)
Constant	123.881***	198.252***	109.061***	143.080***	203.834***	146.172***
	(13.62)	(4.61)	(7.69)	(10.84)	(5.07)	(5.60)
Predicted probability	76.89	73.24	76.85	76.99	73.01	76.97
N	345	244	349	300	225	316
R^2	0.92	0.87	0.91	0.92	0.87	0.87
Test of equality (*p* value):						
Edu ∗ Crisis	0.003	0.048	0.344	0.027	0.013	0.045
Edu ∗ (1 − Crisis)	0.005	0.059	0.433	0.051	0.018	0.065
Edu ∗ Fin.Dev	0.899	0.488	0.953	0.717	0.807	0.343
Edu ∗ (1 − Fin.Dev)	0.953	0.246	0.381	0.614	0.668	0.205
Kleibergen–Paap	–	–	–	0.021	0.018	0.078
Anderson–Rubin	–	–	–	0.000	0.000	0.000
Stock–Wright	–	–	–	0.000	0.000	0.000
Hansen *J*	–	–	–	0.354	0.130	0.224

Note: Statistical significance is denoted at 1% (***), 5% (**) and 10% (*). With reference to the test of equality, Edu ∗ Crisis gives the test of equality between Edu ∗ Crisis ∗ Fin.Dev and Edu ∗ Crisis ∗ (1 − Fin.Dev), Edu ∗ (1 − Crisis) for Edu ∗ (1 − Crisis) ∗ Fin.Dev and Edu ∗ (1 − Crisis) ∗ (1 − Fin.Dev), Edu ∗ Fin.Dev for Edu ∗ Crisis ∗ Fin.Dev and Edu ∗ (1 − Crisis) ∗ Fin.Dev. Finally, Edu ∗ (1 − Fin.Dev) refers to the test of equality between Edu ∗ Crisis ∗ (1 − Fin.Dev) and Edu ∗ (1 − Crisis) ∗ (1 − Fin.Dev). Also, see notes to Table 2.

6. Robustness tests

6.1. Alternative estimation methods

Given the panel dimension of our data-set, and to ensure that our results do not suffer from unobserved country-specific heterogeneity, we employ both random and fixed effects models. The estimates obtained from random and fixed effects are reported in columns 1–3 and 4–5 respectively of Table 5. It is apparent that our main results are upheld. Under the classical assumptions, the random effects estimator is consistent and efficient if all the explanatory variables are uncorrelated with the individual effects. The estimates of the random effects model represent the average effect of

Table 5
Robustness: random-effects and fixed-effects regressions.

Main measure	Dependent variable = Equity home bias					
	(1) RE Tertiary education	(2) RE PISA	(3) RE Financial skills	(4) FE Tertiary education	(5) FE PISA	(6) FE Financial skills
Panel 1						
Education	−0.271***	−0.075**	−0.567***	−0.155**	−0.124*	0.098
	(−3.67)	(−2.13)	(−3.02)	(−2.34)	(−1.95)	(1.44)
Predicted probability	76.89	73.24	76.85	78.83	73.24	78.60
N	345	244	349	345	244	349
R^2	0.31	0.26	0.16	0.38	0.36	0.38
Panel 2						
Edu ∗ (Fin.Dev)	0.093	−0.008	−0.092	−0.009	−0.165	−0.006
	(0.84)	(−0.18)	(−0.43)	(−0.10)	(−1.08)	(−0.05)
Edu ∗ (1 − Fin.Dev)	−0.429***	−0.145***	−0.084	−0.232***	−0.114	0.150*
	(−6.39)	(−3.02)	(−0.65)	(−3.08)	(−1.57)	(1.83)
Predicted probability	76.90	73.24	76.83	78.70	73.24	78.69
N	345	244	349	345	244	349
R^2	0.33	0.25	0.28	0.39	0.36	0.38
Test of equality (*p* value): Edu	0.000	0.010	0.973	0.038	0.770	0.255
Panel 3						
Edu ∗ Crisis ∗ Fin.Dev	0.087	−0.003	−0.017	−0.024	0.104	−0.037
	(0.87)	(−0.06)	(−0.09)	(−0.23)	(0.74)	(−0.31)
Edu ∗ Crisis ∗ (1 − Fin.Dev)	−0.425***	−0.173***	−0.211	−0.228***	−0.170**	0.057
	(−6.40)	(−3.19)	(−1.46)	(−2.96)	(−2.26)	(0.67)
Edu ∗ (1 − Crisis) ∗ Fin.Dev	0.081	0.034	−0.004	−0.009	0.124	−0.019
	(0.82)	(0.63)	(−0.02)	(−0.08)	(0.88)	(−0.17)
Edu ∗ (1 − Crisis) ∗ (1 − Fin.Dev)	−0.403***	−0.122**	−0.131	−0.168**	−0.137*	0.126
	(−4.77)	(−2.47)	(−1.00)	(−2.05)	(−1.97)	(1.53)
Predicted probability	76.90	73.24	76.86	78.63	73.24	79.13
N	345	244	349	345	244	349
R^2	0.34	0.33	0.33	0.40	0.48	0.39
Test of equality (*p* value):						
Edu ∗ Crisis	0.000	0.004	0.396	0.087	0.088	0.517
Edu ∗ (1 − Crisis)	0.000	0.007	0.555	0.223	0.105	0.302
Edu ∗ Fin.Dev	0.887	0.053	0.743	0.462	0.261	0.327
Edu ∗ (1 − Fin.Dev)	0.629	0.013	0.135	0.002	0.064	0.000

Note: The Table reports random-effects regression results in columns 1–3 and fixed-effects regression results in columns 4–6. The remaining specifications, which are not reported for brevity, are identical to those in Tables 2–4. Statistical significance is denoted at 1% (***), 5% (**) and 10% (*). Also, see notes to Table 2.

education over equity home bias when education changes across time and between countries. More specifically, it shows a reduction in equity home bias by 3.51% and 1.02% when *tertiary education* and *mathematical numeracy* increase by 10% respectively, across time and between countries. On splitting the countries on the basis of financial development, the estimates show that a 10% increase in *tertiary education* and *PISA* scores reduces home bias by 5.58% and 1.98%, respectively, in the less developed countries. Finally, the estimates during the crisis period show that a 10% increase in *tertiary education* and *PISA* scores in less developed countries leads to a reduction in the equity home bias by 5.53% and 2.36% respectively, across time and between countries. In tranquil periods, an identical increase in tertiary education and PISA scores in less developed countries will drop the equity home bias by 5.24% and 1.67% respectively, across time and between countries.

The fixed-effects model is aimed at examining the robustness of our findings within countries. We find that for a given country, as *tertiary education* and *mathematical numeracy increase by* 10% across time, equity home bias drops by 1.97% and 1.69%, respectively. Further, we observe that a 10% increase in *tertiary education* reduces home bias in less developed countries by 2.95%. Finally, the estimates during the crisis period show a 10% increase in *tertiary education* and *PISA* scores leads to a reduction in the equity home bias across less developed countries by 2.90% and 2.32% respectively. In tranquil periods, an identical increase in *tertiary education* and *PISA* scores will drop the equity home bias in less developed countries by 2.14% and 1.87%, respectively.[28] Taking these results into consideration, we can conclude that employing both random and fixed effects methods does not make a substantial difference, suggesting that our results are robust to alternative estimation techniques.

[28] The estimates of both random and fixed effects models show that the impact of financial skills on equity home bias remains largely insignificant.

Table 6
Robustness: using alternative measures of equity home bias and financial development.

Main measure	Dependent variable = Scaled equity home bias			Dependent variable = Equity home bias		
	(1) OLS Tertiary education	(2) OLS PISA	(3) OLS Financial skills	(4) OLS Tertiary education	(5) OLS PISA	(6) OLS Financial skills
Panel 1						
Education	−0.205***	−0.164**	−0.594**	−0.328***	−0.221**	−0.647**
	(−2.92)	(−2.23)	(−2.28)	(−3.73)	(−2.17)	(−2.43)
Fin.Dev2	–	–	–	9.502*	1.646	−3.274
	–	–	–	(2.02)	(0.19)	(−0.55)
Predicted probability	78.59	75.08	78.59	76.88	73.24	76.87
N	345	244	349	345	244	349
R^2	0.93	0.85	0.85	0.93	0.84	0.85
Panel: 2						
Edu ∗ (Fin.Dev)	0.169	−0.014	0.095	–	–	–
	(1.26)	(−0.17)	(0.50)	–	–	–
Edu ∗ (1 − Fin.Dev)	−0.411***	−0.258**	−0.019	–	–	–
	(−4.54)	(−2.44)	(−0.16)	–	–	–
Edu ∗ (Fin.Dev2)	–	–	–	0.004	0.208	−0.957**
	–	–	–	(0.02)	(1.34)	(−2.19)
Edu ∗ (1 − Fin.Dev2)	–	–	–	−0.445***	−0.340***	−0.414*
	–	–	–	(−4.21)	(−4.25)	(−1.86)
Predicted probability	78.60	75.08	78.59	76.95	73.24	76.86
N	345	244	349	345	244	349
R^2	0.92	0.90	0.91	0.85	0.91	0.85
Test of equality (*p* value): Edu	0.004	0.027	0.554	0.051	0.005	0.239
Panel: 3						
Edu ∗ Crisis ∗ Fin.Dev	0.171	−0.001	0.105	–	–	–
	(1.27)	(−0.01)	(0.57)	–	–	–
Edu ∗ Crisis ∗ (1 − Fin.Dev)	−0.428***	−0.265**	−0.104	–	–	–
	(−4.67)	(−2.41)	(−0.74)	–	–	–
Edu ∗ (1 − Crisis) ∗ Fin.Dev	0.211	−0.000	0.132	–	–	–
	(1.47)	(−0.01)	(0.72)	–	–	–
Edu ∗ (1 − Crisis) ∗ (1 − Fin.Dev)	−0.396***	−0.253**	−0.044	–	–	–
	(−3.97)	(−2.31)	(−0.35)	–	–	–
Edu ∗ Crisis ∗ Fin.Dev2	–	–	–	−0.021	0.216	−0.932**
	–	–	–	(−0.11)	(1.25)	(−2.04)
Edu ∗ Crisis ∗ (1 − Fin.Dev2)	–	–	–	−0.465***	−0.420***	−0.487**
	–	–	–	(−4.42)	(−4.62)	(−2.10)
Edu ∗ (1 − Crisis) ∗ Fin.Dev2	–	–	–	−0.003	0.298*	−0.900**
	–	–	–	(−0.02)	(1.80)	(−2.03)
Edu ∗ (1 − Crisis) ∗ (1 − Fin.Dev2)	–	–	–	−0.420***	−0.320***	−0.424*
	–	–	–	(−3.85)	(−4.01)	(−1.91)
Predicted probability	78.60	75.08	78.60	76.94	73.24	76.88
N	345	244	349	345	244	349
R^2	0.92	0.90	0.92	0.85	0.92	0.85
Test of equality (*p* value):						
Edu ∗ Crisis	0.004	0.023	0.316	0.051	0.003	0.355
Edu ∗ (1 − Crisis)	0.004	0.026	0.364	0.072	0.004	0.313
Edu ∗ Fin.Dev	0.258	0.938	0.376	0.561	0.002	0.374
Edu ∗ (1 − Fin.Dev)	0.468	0.043	0.221	0.127	0.001	0.007

Note: The Table reports OLS regression results for scaled equity home bias in columns 1–3 and equity home bias in columns 4–6. The remaining specifications, which are not reported for brevity, are identical to those in Tables 2–4. Statistical significance is denoted at 1% (***), 5% (**) and 10% (*). Also, see notes to Table 2.

6.2. An alternative measure of home bias and financial development

Next, we modify the measure of equity home bias in the spirit of Bekaert and Wang (2009). The authors argue that there is a size bias in the previous measure of home bias shown in Eq. (2) and hence large markets might display lower levels of home bias. To solve this potential problem of size bias, Bekaert and Wang (2009) scale the home bias measure in Eq. (2) by the maximum home bias:

$$\overline{HB}_{it} = \frac{HB_{it}}{(1 - (M_{it}/W))}$$

where HB_{it} is the home bias measure in Eq. (2), M_{it} is the market capitalisation of country *i* for time period *t*, *W* is the world market capitalisation.

Table 7
Robustness: Tobit models.

Main measure	Dependent variable = Equity home bias					
	(1) TOBIT Tertiary education	(2) TOBIT PISA	(3) TOBIT Financial skills	(4) TOBIT Tertiary education	(5) TOBIT PISA	(6) TOBIT Financial skills
Panel 1						
Education	−0.405***	−0.167**	−0.729***	−0.308***	−0.196**	−0.884***
	(−3.32)	(−2.06)	(−3.21)	(−2.60)	(−2.37)	(−3.11)
Predicted probability	88.33	78.02	85.17	90.84	88.32	96.61
Uncensored Observations	211	170	216	163	133	165
Left Censored Observations	0	0	0	1	1	1
Right Censored Observations	134	74	133	181	110	183
Pseudo R^2	0.20	0.19	0.25	0.28	0.24	0.30
Panel 2						
Edu ∗ (Fin.Dev)	0.061	−0.016	−0.085	0.040	−0.018	−0.032
	(0.42)	(−0.32)	(−0.46)	(0.39)	(−0.87)	(−0.18)
Edu ∗ (1 − Fin.Dev)	−0.559***	−0.181**	−0.058	−0.480***	−0.363*	0.020
	(−3.68)	(−2.15)	(−0.33)	(−2.93)	(−1.69)	(0.14)
Predicted probability	85.91	78.17	85.76	86.99	86.89	88.88
Uncensored Observations	211	170	216	163	133	165
Left Censored Observations	0	0	0	1	1	1
Right Censored Observations	134	74	133	181	110	183
Pseudo R^2	0.39	0.33	0.32	0.41	0.42	0.40
Test of equality (p value): Edu	0.011	0.043	0.899	0.022	0.092	0.812
Panel 3						
Edu ∗ Crisis ∗ Fin.Dev	0.172	−0.001	−0.021	0.097	−0.024	0.041
	(1.64)	(−0.01)	(−0.15)	(1.29)	(−0.29)	(0.28)
Edu ∗ Crisis ∗ (1 − Fin.Dev)	−0.722***	−0.314**	−0.229	−0.423***	−0.521***	−0.184
	(−4.47)	(−2.46)	(−1.12)	(−3.88)	(−3.26)	(−0.70)
Edu ∗ (1 − Crisis) ∗ Fin.Dev	0.206*	−0.007	0.009	0.143	0.021	0.053
	(1.72)	(−0.08)	(0.06)	(2.75)	(0.25)	(0.32)
Edu ∗ (1 − Crisis) ∗ (1 − Fin.Dev)	−0.656***	−0.302**	−0.096	−0.327***	−0.461***	−0.077
	(−4.41)	(−2.43)	(−0.52)	(−3.31)	(−3.24)	(−0.38)
Predicted probability	85.40	80.51	86.10	88.02	85.71	88.35
Uncensored Observations	211	170	216	163	133	165
Left Censored Observations	0	0	0	1	1	1
Right Censored Observations	134	74	133	181	110	183
Pseudo R^2	0.36	0.28	0.33	0.42	0.34	0.41
Test of equality (p value):						
Edu ∗ Crisis	0.000	0.014	0.286	0.001	0.002	0.452
Edu ∗ (1 − Crisis)	0.000	0.018	0.570	0.000	0.003	0.617
Edu ∗ Fin.Dev	0.527	0.858	0.492	0.396	0.516	0.807
Edu ∗ (1 − Fin.Dev)	0.327	0.703	0.076	0.167	0.380	0.230

Notes: The Table reports Tobit regressions with an upper bound of 90 and lower bound of 10 in columns 1–3 and Tobit regressions with an upper bound of 80 and lower bound of 20 in columns 4–6. The remaining specifications, which are not reported for brevity, are identical to those in Tables 2–4. Statistical significance is denoted at 1% (***), 5% (**) and 10% (*). Also, see notes to Table 2.

Columns 1–3 of Table 6 present the results using the scaled equity home bias the main measures of education in three panels that correspond to the estimated models. The baseline results in panel 1 are similar both quantitatively and qualitatively with those shown in Section 5.1, which demonstrates the stability of the baseline model. Taking into account the differences between more and less financially developed economies in panel 2, the results indicate that tertiary education and mathematical numeracy reduce scaled equity home bias in less financially developed economies significantly compared to more financially developed economies. Further, in panel 3 we find that this effect is stronger during the crisis period for the less developed economies. To sum up, we conclude that our results are robust to an alternative measure of home bias.

We also re-estimate the models from Tables 2–4 using an alternative measure of financial development and report the results for the main measures of education in columns 4–6 of Table 6. In our main empirical results we used the average stock market capitalisation as a sorting device for more and less developed economies. In order to ensure that our results are not driven from the way that we divide our sample, we use a robust framework in order to achieve a good measure of financial development. In particular, we classify our countries into more and less financially developed using the mean of total value of stock traded to gross domestic product (GDP) ratio.[29] We construct a dummy variable (*Fin.Dev2*) which takes the value one for more developed economies and zero otherwise.

[29] This variable has been employed in a number of recent studies such as Chinn and Ito (2006), Aizenman and Pasricha (2012) and Čihák et al. (2013) as a measure of financial development. The data for total value of stock traded to GDP are drawn from the World Bank.

Table 8
Robustness: regressions for different sub-samples.

Main measure	Dependent variable = Equity home bias					
	Less financially developed countries			More financially developed countries		
	(1) OLS Tertiary education	(2) OLS PISA	(3) OLS Financial skills	(4) OLS Tertiary education	(5) OLS PISA	(6) OLS Financial skills
Panel 1						
Education	−0.226***	−0.108*	−0.358*	0.172	0.176	−0.369
	(−3.24)	(−1.89)	(−1.78)	(1.09)	(1.72)	(−1.64)
Predicted probability	106.56	78.46	74.96	83.46	71.75	75.42
N	209	150	210	136	94	139
R^2	0.96	0.88	0.86	0.97	0.98	0.90
Panel 2						
Edu ∗ Crisis	−0.281***	−0.096*	−0.335	0.344	0.266	−0.537*
	(−3.42)	(−1.85)	(−1.47)	(1.53)	(1.64)	(−1.82)
Edu ∗ (1 − Crisis)	−0.190**	−0.042	−0.366*	0.306**	0.270	−0.344
	(−2.21)	(−1.15)	(−1.81)	(2.37)	(1.66)	(−1.49)
Predicted probability	84.97	74.79	74.96	72.34	60.07	75.90
N	209	150	210	136	94	139
R^2	0.95	0.92	0.86	0.96	0.97	0.90
Test of equality (*p* value):						
Edu	0.002	0.061	0.805	0.787	0.005	0.336

Note: The table reports OLS regression results for less financially developed countries in columns 1–3 and more financially developed countries in columns 4–6. The remaining specifications, which are not reported for brevity, are identical to those in Tables 2–4. Statistical significance is denoted at 1% (***), 5% (**) and 10% (*). Also, see notes to Table 2.

Our main findings are broadly confirmed that increasing tertiary education and mathematical numeracy are likely to lead to a reduction in the equity home bias. In addition, we confirm our finding that this effect is more important in the less developed economies compared to their more developed counterparts, especially during the financial crisis. Hence, we conclude that our main empirical results are robust to an alternative definition of financial development.

6.3. Tobit regressions

We employ a Tobit model to account for the fact that the dependent variable, equity home bias, is censored from above and below. Columns 1–3 of Table 7 report results of equity home bias with an upper limit of 90 and lower limit of 10, while columns 4–6 refer to an upper limit of 80 and a lower limit of 20 for the equity home bias.

The results confirm a negative and significant impact of *tertiary education* and *mathematical numeracy* on equity home bias. Further, we find that this negative effect is stronger for less financially developed countries, compared to their more developed counterparts. Finally, during both crisis and non-crisis periods education reduces equity home bias in less financially developed countries. Hence, we conclude that our results are robust to using Tobit models which account for the fact that the equity home bias is bounded from above and below.

6.4. Regressions for different sub-samples

To confirm that our results are not affected by any outliers i.e. countries which have extreme values of equity home bias, we run the regressions separately for the two groups of economies.[30] Columns 1–3 of Table 8 present results for less financially developed countries and columns 4–6 show the results for more financially developed countries. The baseline results in panel 1 are qualitatively and quantitatively similar to the main results. The estimates show a significant and negative impact of *tertiary education* and *mathematical numeracy* on equity home bias for the less financially developed countries, while education has an insignificant impact for more financially developed countries.

In panel 2 we take into account the crisis and non-crisis periods and the results show that education helps to reduce equity home bias for less developed countries in both crisis and non-crisis periods, while education has an insignificant impact for more developed countries. The test of equality for education also shows a significant difference between the coefficient values in crisis and non-crisis periods for less developed countries. Overall, we confirm that our results are qualitatively and quantitatively similar to the main results.

[30] In our main results instead of estimating the models for different sub-samples we interact the education variable in all our specifications with dummy variables indicating different time periods or groups of economies. This approach allows us to avoid problems of endogenous sample selection; helps to gain degrees of freedom; and to take into consideration the fact that economies can transit between groups.

7. Conclusion

A number of studies published recently have identified that education matters in affecting the process of financial decision making. In this paper we ask whether education makes countries more likely to display a lower degree of home bias. We then take into account country-level heterogeneity and explore the above link when a crisis occurs. Credit availability has been widely cited as a constraint to expansion in Western countries during the recent crisis, but lower levels of education and habitual reliance on domestic portfolios could explain why home bias has remained at elevated levels in the developed economies through the early stages of the financial crisis.

This paper examines the impact of education on home bias in equity portfolios. Our results, based on a panel of economies that exhibit substantial heterogeneity in financial development during the period of 2001–2010, suggest that education plays a crucial role in the reduction of home bias in equity holdings. After separating countries into more and less developed groups, using average stock market capitalisation, we find that less developed countries tend to benefit more in terms of a reduction in the equity home bias from an increase in the level of education compared to their more developed counterparts. We also find that the levels of education and numeracy of less financially developed economies were more sensitive to equity home bias during the global financial crisis than the more developed economies.

Our results are also policy relevant. The results presented in this paper suggest that maintaining high levels of education and numeracy would substantially increase international portfolio diversification. Hence, embedding financial education in a curriculum should be high on a policymaker's agenda, especially for emerging market economies.

Appendix.

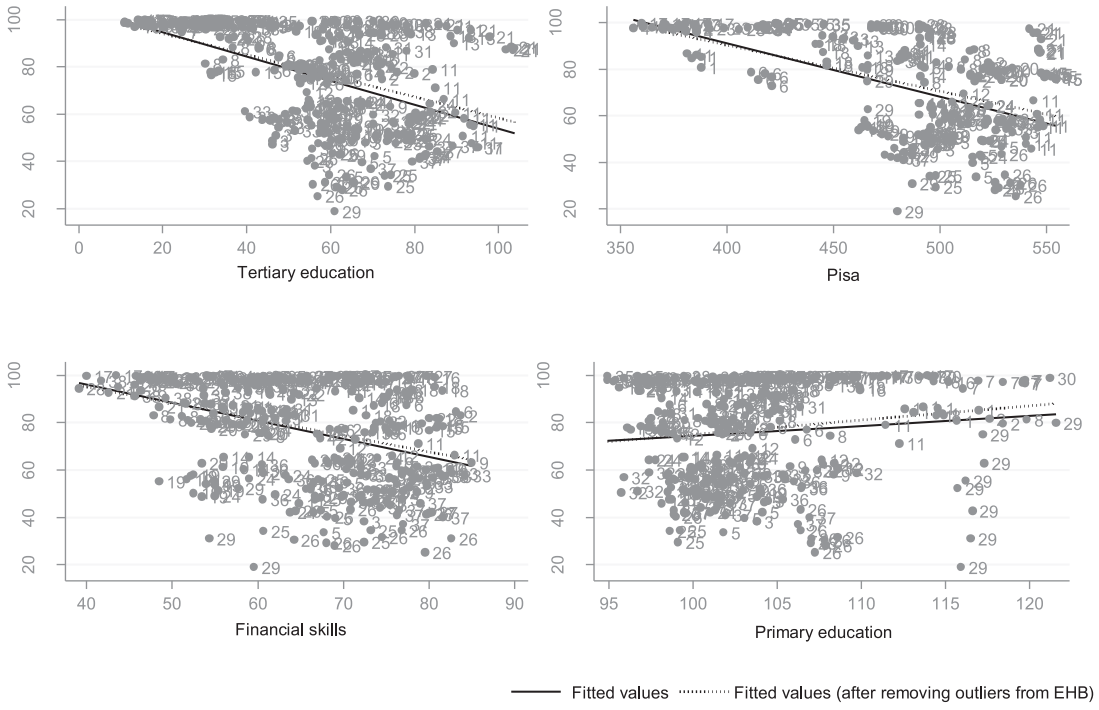

Fig. A.1. Scatter plots for different measures of education and equity home bias. *Note*: The graph shows best fitting regression lines for education and equity home bias. The dotted fitted line is generated from regressions after dropping outliers in the 5% upper and lower tails of the distribution of the equity home bias variable.

Note: Country codes: 1 – Argentina, 2 – Australia, 3 – Austria, 4 – Brazil, 5 – Belgium, 6 – Chile, 7 – Colombia, 8 – Czech. Republic, 9 – Denmark, 10 – Egypt, 11 – Finland, 12 – France, 13 – Greece, 14 – Hungary, 15 – Hong Kong, 16 – India, 17 – Indonesia, 18 – Israel, 19 – Italy, 20 – Japan, 21 – Korea, 22 – Malaysia, 23 – Mexico, 24 – New Zealand, 25 – Norway, 26 – Netherlands, 27 – Philippines, 28 – Poland, 29 – Portugal, 30 – Russia, 31 – Spain, 32 – Sweden, 33 – Switzerland, 34 – Thailand, 35 – Turkey, 36 – United Kingdom, 37 – United States, 38 – Venezuela (EHB).

Table A.1
Definitions of the variables.

Variables	Description	Source
Tertiary education	This is measured as school enrolments to tertiary education. Tertiary school enrolment is the total enrolment in tertiary education (ISCED 5 and 6), regardless of age, expressed as a percentage of the total population of the five-year age group following on from secondary school leaving.	World Development Indicators (WDI) of World Bank
Financial skills	'*Financial skills*' question reads as 'finance skills readily available' and this statement is evaluated on a scale of 0–10.	IMD World Competitiveness Yearbook (WCY)
PISA	Evaluates the knowledge and skills of 15-year-olds in mathematics.	IMD World Competitiveness Yearbook (WCY)
Primary education	Total enrolment in primary education, regardless of age, expressed as a percentage of the population of official primary education age.	IMD World Competitiveness Yearbook (WCY)
Fin.Dev	This is a dummy equal to one if a country's stock market capitalisation is greater than the average than the mean and zero otherwise.	World Development Indicators (WDI) of World Bank
GDP growth	Annual percentage growth rate of GDP at market prices based on constant local currency.	World Development Indicators (WDI) of World Bank
Foreign Direct Investment (FDI)	Net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors, and is divided by GDP.	World Development Indicators (WDI) of World Bank
Trade	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.	World Development Indicators (WDI) of World Bank
Labour force size	Total labour force comprises people ages 15 and older who supply labour for the production of goods and services during a specified period.	World Development Indicators (WDI) of World Bank
English legal origin	This is a dummy equal to one if a country has English as the legal origin and zero otherwise.	La Porta et al. (2008)
Financial openness	This variable includes the presence of multiple exchange rates, the existence of restrictions on current account transactions, the existence of restrictions on capital account transactions and the requirement of the surrender of export proceeds.	Chinn-Ito Index of financial openness
Market turnover	It is the total value of shares traded during the period divided by the average market capitalisation for the period.	World Development Indicators (WDI) of World Bank
Domestic credit	It refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable, that establish a claim for repayment.	World Development Indicators (WDI) of World Bank
Stock market capitalisation	Market capitalisation is the share price times the number of shares outstanding of listed companies as a percentage of GDP.	World Development Indicators (WDI) of World Bank
Current ratio	It is the ratio of total current assets to total current liabilities.	DataStream
Leverage	It is the ratio of total debt to total assets.	DataStream
Euro	Euro is a dummy equal to one if a country is a member of the Euro-area and zero otherwise.	Eurozone website
Unemployment rate	The share of the labour force that is without work but available for and seeking employment.	World Development Indicators (WDI) of World Bank

Note: The table reports the exact definition of the variables used in the models.

Table A.2
Distribution of the equity home bias and measures of education over 2001–2010.

Country	Average equity home bias (%)	Tertiary education	PISA score	Financial skills
Argentina	86.53	66.33	385.34	63.65
Australia	79.40	72.75	518.84	75.45
Austria	50.60	52.72	502.02	74.31
Brazil	97.40	21.91	372.35	60.54
Belgium	45.87	62.64	520.61	70.55
Chile	82.63	50.36	417.18	75.67
Colombia	96.89	30.89	376.50	65.23
Czech Republic	82.35	47.63	505.00	53.83
Denmark	57.22	72.64	509.61	77.14
Egypt	98.39	30.98	–	–

Table A.2 (*Continued*)

Country	Average equity home bias (%)	Tertiary education	PISA score	Financial skills
Finland	59.03	90.56	544.32	75.82
France	66.18	54.65	499.87	70.00
Greece	90.51	78.18	458.24	60.66
Hong Kong	77.60	42.99	550.75	76.69
Hungary	82.43	58.15	490.42	63.33
India	97.92	12.65	–	73.73
Indonesia	99.43	17.64	375.87	47.35
Israel	90.10	57.81	444.86	76.84
Italy	54.57	61.89	470.73	53.11
Japan	78.65	55.53	528.03	56.33
Malaysia	96.38	30.63	–	67.93
Mexico	98.10	24.60	405.31	49.74
Netherlands	33.47	59.15	530.68	73.32
New Zealand	57.24	76.81	521.23	64.23
Norway	45.35	75.50	494.18	70.05
Philippines	99.52	28.70	–	72.66
Poland	96.57	64.46	493.84	50.56
Portugal	57.67	56.99	473.89	56.58
Russia	98.51	70.32	470.81	60.91
South Korea	92.82	94.99	545.63	54.50
Spain	85.39	67.85	482.54	60.00
Sweden	56.46	76.22	500.96	76.37
Switzerland	57.30	46.54	530.61	79.07
Thailand	98.33	43.33	417.62	57.54
Turkey	99.57	35.49	431.77	68.51
UK	56.48	59.35	493.62	64.90
USA	42.77	82.90	481.41	77.05
Venezuela	95.28	55.22	–	49.64

Note: The table reports the average equity home bias and different measures of education.

Table A.3
Diagnostic and identification statistics from first-stage IV regressions.

Main measure	(1) Tertiary education	(2) PISA	(3) Financial skills
Panel 1			
Unemployment rate	−0.790**	−0.083	−0.170
	(−2.07)	(−0.08)	(−0.92)
Primary education	−0.973***	−2.219***	−0.299**
	(−4.17)	(−2.80)	(−2.39)
F test	0.000	0.000	0.000
Angrist–Pischke chi-square test	0.037	0.000	0.002
N	320	222	316
R^2	0.78	0.97	0.78
Panel 2			
Edu ∗ (Fin.Dev):			
Unemployment rate	0.595***	1.288	0.102
	(3.69)	(1.07)	(0.87)
Primary education	0.228*	2.735***	0.436***
	(1.77)	(4.60)	(6.75)
F test	0.000	0.000	0.000
Angrist–Pischke chi-square test	0.019	0.065	0.373
N	321	230	315
R^2	0.96	0.99	0.99
Edu ∗ (1 − Fin.Dev):			
Unemployment rate	−1.318***	−1.034	−0.438**
	(−4.32)	(−1.21)	(−2.29)
Primary education	−0.650***	−5.188***	−0.520***
	(−3.76)	(−11.47)	(−4.30)

Table A.3 (*Continued*)

Main measure	(1) Tertiary education	(2) PISA	(3) Financial skills
F test	0.000	0.000	0.000
Angrist–Pischke chi-square test	0.000	0.003	0.000
N	321	230	315
R^2	0.95	0.99	0.98
Panel 3			
Edu ∗ Crisis ∗ Fin.Dev:			
Unemployment rate	2.147***	−1.171	0.234
	(4.22)	(−0.85)	(0.29)
Primary education	0.162	1.778***	0.358
	(0.95)	(3.91)	(1.49)
F test	0.000	0.000	0.000
Angrist–Pischke chi-square test	0.002	0.009	0.999
N	300	225	316
R^2	0.91	0.99	0.76
Edu ∗ Crisis ∗ (1 − Fin.Dev):			
Unemployment rate	−1.108**	−3.950*	0.167
	(−2.51)	(−1.70)	(0.38)
Primary education	−0.060	−2.799***	−0.482***
	(−0.34)	(−3.88)	(−2.99)
F test	0.000	0.000	0.000
Angrist–Pischke chi-square test	0.012	0.292	0.645
N	300	225	316
R^2	0.91	0.99	0.90
Edu ∗ (1 − Crisis) ∗ Fin.Dev:			
Unemployment rate	−1.260***	1.898	−0.033
	(−2.58)	(1.21)	(−0.04)
Primary education	−0.180	1.949***	0.074
	(−0.95)	(3.50)	(0.29)
F test	0.000	0.000	0.000
Angrist–Pischke chi-square test	0.015	0.011	0.999
N	300	225	316
R^2	0.93	0.99	0.82
Edu ∗ (1 − Crisis) ∗ (1 − Fin.Dev):			
Unemployment rate	0.083	1.089	−0.812*
	(0.26)	(0.39)	(−1.75)
Primary education	−0.324	−4.181***	−0.078
	(−1.62)	(−4.79)	(−0.42)
F test	0.000	0.000	0.000
Angrist–Pischke chi-square test	0.092	0.681	0.710
N	300	225	316
R^2	0.92	0.98	0.91

Note: The Table reports first-stage regressions for the two instruments of education- unemployment rate (%) and primary education (%). The *F* statistic provides a test of excluded instruments and Angrist–Pischke chi-square test is a test of under-identification under the null that the particular endogenous regressor in question is unidentified. Statistical significance is denoted at 1% (***), 5% (**) and 10% (*). Also, see notes to Table 2.

Table A.4
Correlation matrix of explanatory variables.

	EHB	Scaled EHB	Fin. skills	PISA	Ter. edu.	Pri. edu.	GDP gr.	FDI	Trade	Labour size	English	Fin. open.	Turnover ratio	Dom. credit	Current ratio	Lev.	Euro	Market cap.	Stock traded	Unemp
EHB	1.00																			
Scaled EHB	0.97[a]	1.00																		
Fin. skills	−0.38[a]	−0.35[a]	1.00																	
PISA	−0.55[a]	−0.54[a]	0.40[a]	1.00																
Ter. edu	−0.49[a]	−0.46[a]	0.11[b]	0.57[a]	1.00															
Pri. edu.	0.13[b]	0.10[c]	−0.15[a]	−0.45[a]	−0.30[a]	1.00														
GDP gr.	0.37[a]	0.37[a]	−0.00	−0.25[a]	−0.22[a]	0.39	1.00													
FDI	−0.14[a]	−0.15[a]	0.15[b]	0.20[a]	−0.01	−0.13[b]	0.05	1.00												
Trade	−0.10	−0.14[a]	0.21[a]	0.39[a]	−0.07	−0.31[b]	0.06	0.58[a]	1.00											
Labour size	0.19[a]	0.28[a]	0.03	−0.42[a]	−0.37[a]	0.14[b]	0.23[a]	−0.14[a]	−0.25[a]	1.00										
English	−0.01	0.06	0.27[a]	0.12[c]	−0.05	−0.24[a]	0.11[b]	0.09[c]	0.26[a]	0.30[a]	1.00									
Fin. open.	−0.68[a]	−0.66[a]	0.26[a]	0.54[a]	0.39[a]	−0.21[a]	−0.33[a]	0.21[a]	0.17[a]	−0.37[a]	−0.06	1.00								
Turnover ratio	−0.35[a]	−0.27[a]	0.10[c]	0.37[a]	0.40[a]	−0.21[a]	−0.11[b]	0.02	−0.05	0.17[a]	0.13[b]	0.19[a]	1.00							
Dom. credit	−0.56[a]	−0.48[a]	0.23[a]	0.46[a]	0.30[a]	−0.16[a]	−0.33[a]	0.02	0.09[c]	−0.06	0.23[a]	0.55[a]	0.42[a]	1.00						
Current ratio	−0.03	−0.04	−0.01	0.03	−0.02	0.02	−0.13[b]	−0.04	0.06	−0.03	0.01	0.02	0.04	−0.00	1.00					
Lev.	−0.12[b]	−0.12[b]	−0.02	−0.12[c]	0.11[b]	0.04	−0.24[a]	−0.14[a]	−0.22[a]	0.03	−0.02	0.11[b]	0.08	0.14[a]	−0.09[c]	1.00				
Euro	−0.45[a]	−0.49[a]	0.03	0.22[a]	0.25[a]	0.10[c]	−0.25[a]	0.05	0.01	−0.19[a]	−0.31[a]	0.43[a]	0.13[b]	0.21[a]	−0.06	0.27[a]	1.00			
Market cap.	−0.15[a]	−0.11[b]	0.43[a]	0.38[a]	0.06	−0.23[a]	0.08	0.45[a]	0.65[a]	−0.05	0.40[a]	0.25[a]	0.17[a]	0.34[a]	−0.05	−0.14[a]	−0.10[c]	1.00		
Stock traded	−0.32[a]	−0.24[a]	0.30[a]	0.43[a]	0.26[a]	−0.21[a]	−0.05	0.37[a]	0.40[a]	0.03	0.31[a]	0.30[a]	0.61[a]	0.46[a]	0.00	−0.06	0.00	0.77[a]	1.00	
Unemp	0.32[a]	0.30[a]	−0.17[a]	−0.28[a]	−0.06	0.29[a]	−0.05	−0.09[c]	−0.27[a]	−0.13[b]	−0.036[a]	−0.17[a]	−0.28[a]	−0.35[a]	0.03	0.14[a]	0.09[c]	−0.26[a]	−0.29[a]	1.00

Note: The table reports the pairwise correlation matrix between different explanatory variables used in the models. Statistical significance is denoted at 1% ([a]), 5% ([b]) and 10% ([c]). *Abbreviations*: Fin. skills, financial skills; Ter. edu, tertiary education; Pri.edu, primary education; GDP gr., GDP growth; English, English legal origin dummy; Fin. Open., financial openness; Dom. Credit, domestic credit; Lev., leverage; Euro, Euro dummy; Market cap., stock market capitalisation; Unemp, unemployment rate.

References

Adler, M., Dumas, B., 1983. International portfolio choice and corporation finance: a synthesis. J. Financ. 38, 925–984.
Agnew, J., Szykman, L., 2005. Asset allocation and information overload: the influence of information display, asset choice and investor experience. J. Behav. Financ. 6, 57–70.
Ahearne, A., Grivier, W., Warnock, F., 2004. Information costs and home bias: an analysis of US holdings of foreign equities. J. Int. Econ. 62, 313–336.
Aizenman, J., Pasricha, G.K., 2012. Determinants of financial stress and recovery during the great recession. Int. J. Financ. Econ. 17, 347–372.
Almeida, H., Campello, M., Galvao Jr., A.F., 2010. Measurement errors in investment equations. Rev. Financ. Stud. 23, 3279–3328.
Arghyrou, M.G., Kontonikas, A., 2012. The EMU sovereign-debt crisis: fundamentals, expectations and contagion. J. Int. Financ. Mark. Inst. Money 22, 658–677.
Baele, L., Pungulescu, C., Horst, J.T., 2007. Model uncertainty, financial market integration and the home bias puzzle. J. Int. Money Financ. 26, 606–630.
Banks, J., Oldfield, Z., 2007. Understanding pensions: cognitive function, numeracy and retirement saving. Fisc. Stud. 28, 143–170.
Bekaert, G., Harvey, C.R., Lundblad, C., 2001. Emerging equity markets and economic development. J. Dev. Econ. 66, 465–504.
Bekaert, G., Harvey, C.R., Lundblad, C., Siegel, S., 2007. Global growth opportunities and market integration. J. Financ. 62, 1081–1831.
Bekaert, G., Wang, X., 2009. Home Bias Revisited. Mimeo. Columbia Business School.
Bernheim, D., 1995. Do Households Appreciate Their Financial Vulnerabilities? An Analysis of Actions, Perceptions, and Public Policy, Tax Policy and Economic Growth. American Council for Capital Formation, Washington, DC, pp. 1–30.
Bernheim, D., 1998. Financial illiteracy, education and retirement saving. In: Mitchell, O.S., Schieber, S. (Eds.), Living with Defined Contribution Pensions. University of Pennsylvania Press, Philadelphia, pp. 38–68.
Bernheim, D., Garrett, D., 2003. The effects of financial education in the workplace: evidence from a survey of households. J. Public Econ. 87, 1487–1519.
Burger, J., Warnock, F., 2003. Diversification, Original Sin, and International Bond Portfolios, International Finance Discussion Paper 755. Board of Governors of the Federal Reserve System.
Burger, J., Warnock, F., 2006. Local currency bond markets. IMF Staff Pap. 53, 133–146.
Campbell, J., 2006. Household finance. J. Financ. 61, 1553–1604.
Chan, K., Covrig, V., Ng, L., 2005. What determines the domestic bias and foreign bias? Evidence from mutual fund equity allocations worldwide. J. Financ. 60, 1495–1534.
Chinn, M.D., Ito, H., 2006. What matters for financial development? Capital controls, institutions, and interactions. J. Dev. Econ. 81, 163–192.
Christelis, D., Jappelli, T., Padula, M., 2010. Cognitive abilities and portfolio choice. Eur. Econ. Rev. 54, 18–39.
Čihák, M., Demirgüč-Kunt, A., Feyen, E., Levine, R., 2013. Financial development in 205 economies, 1960 to 2010. J. Financ. Perspect. 1, 17–36.
Coeurdacier, N., Rey, H., 2013. Home bias in open economy financial macroeconomics. J. Econ. Lit. 51, 63–115.
Cole, S., Sampson, T., Zia, B., 2011. Prices or knowledge? What drives demand for financial services in emerging markets? J. Financ. LXVI (6).
Cole, S.A., Paulson, A.L., Shastry, G.K., 2012. Smart Money: The Effect of Education on Financial Behavior. Harvard Business School Finance, Working Chapter No. 09-071.
Cooper, I.A., Kaplanis, E., 1994. Home bias in equity portfolios, inflation hedging and international capital market equilibrium. Rev. Financ. Stud. 7, 45–60.
Coval, J., Moskowitz, T., 1999. Home bias at home: local equity preference in domestic portfolios. J. Financ. 54, 2045–2073.
De Moor, L., Vanpée, R., 2013. What drives international equity and bond holdings? An empirical study. Appl. Financ. Econ. 23, 1067–1082.
Demirguc-Kunt, A., Levine, R., 1996. Stock market development and financial intermediaries: stylized facts. World Bank Econ. Rev. 10, 291–321.
Driessen, J., Laeven, L., 2007. International portfolio diversification benefits: cross-country evidence from a local perspective. J. Bank. Financ. 31, 1693–1712.
Edison, H.J., Warnock, F.E., 2004. US investors' emerging market equity portfolios: a security-level analysis. Rev. Econ. Stat. 86, 691–704.
Eichengreen, B., Borensztein, E., Panizza, U., 2006. A Tale of Two Markets: Bond Market Development in East Asia and Latin America. Hong Kong Institute for Monetary Research, Occasional Paper No. 3.
Fellner, G., Maciejovsky, B., 2003. The Equity Home Bias: Contrasting an Institutional with a Behavioural Explanation. Max Planck, Discussion Paper No. 3-2003.
Fidora, M., Fratzscher, M., Thimann, C., 2007. Home bias in global bond and equity markets: the role of real exchange rate volatility. J. Int. Money Financ. 26, 222–225.
French, K., Poterba, J., 1991. Investor diversification and international equity markets. Am. Econ. Rev. 81, 222–226.
Gelos, R.G., Wei, S.-J., 2005. Transparency and international portfolio holdings. J. Financ. 60, 2987–3020.
Gerardi, K., Goette, L., Meier, S., 2010. Financial Literacy and Subprime Mortgage Delinquency: Evidence from a Survey Matched to Administrative Data. Federal Reserve Bank of Atlanta, Working Papers, No. 2010-10.
Giannetti, M., Koskinen, Y., 2010. Investor protection, equity returns, and financial globalization. J. Financ. Quant. Anal. 45, 135–168.
Giannone, D., Lenza, M., Reichlin, L., 2010. Market Freedom and the Global Recession. ECARES, Working Paper 2010-020.
Giofre, M., 2012. Financial Education, Investor Protection and International Portfolio Diversification. Netspar, Discussion Chapter No. 04/2012-021.
Goetzmann, W.N., Kumar, A., 2003. Diversification Decisions of Individual Investors and Asset Prices. Yale School of Management, Working Papers No. ysm441.
Graham, J.R., Harvey, C.R., Huang, H., 2009. Investor competence, trading frequency, and home Bias. Manage. Sci. 55, 1094–1106.
Guiso, L., Jappelli, T., 2005. Awareness and stock market participation. Rev. Financ. 9, 537–567.
Guiso, L., Jappelli, T., 2008. Financial Literacy and Portfolio Diversification. CSEF, Working Chapter 212.
Harvey, C.R., 1995. Predictable risk and returns in emerging markets. Rev. Financ. Stud. 8, 773–816.
Heath, C., Tversky, A., 1991. Preferences and beliefs: ambiguity and the competence in choice under uncertainty. J. Risk Uncertain. 4, 5–28.
Hilgert, M., Hogarth, J., Beverly, S., 2003. Household financial management: the connection between knowledge and behavior. Fed. Reserve Bull., 309–322.
Ivkovic, Z., Weisbenner, S., 2005. Local does as local is: information content of the geography of individual investors' common stock investments. J. Financ. 60, 267–306.
Jappelli, T., 2010. Economic literacy: an international comparison. Econ. J. 120, F429–F451.
Jappelli, T., Padula, M., 2013. Investment in financial literacy and saving decisions. J. Bank. Financ. 37, 2779–2792.
Kang, J., Stulz, R.M., 1997. Why is there a home bias? An analysis of foreign portfolio equity ownership in Japan. J. Financ. Econ. 46, 3–28.
Karlsson, A., Nordén, L., 2007. Home sweet home: home bias and international diversification among individual investors. J. Bank. Financ. 31, 317–333.
Karolyi, A., Stulz, R., 2003. Are financial assets priced locally or globally? In: Constantinides, G., Harris, M., Stulz, R.M. (Eds.), Handbook of the Economics of Finance. Elsevier North Holland.
Kennickell, A.B., Kwast, M.L., Starr-McCluer, M., 1996. Household's deposit insurance coverage: evidence and analysis of potential reforms. J. Money Credit Bank. 28, 311–322.
Kilka, M., Weber, M., 2000. Home bias in international stock return expectation. J. Psychol. Financ. Mark. 1, 176–192.
Kimball, M., Shumway, T., 2010. Investor Sophistication, and the Participation, Home Bias, Diversification, and Employer Stock Puzzles. Mimeo. University of Michigan.
Klapper, L.F., Panos, G.A., 2011. Financial literacy and retirement planning: the Russian case. J. Pension Econ. Financ. 10, 599–618.
Klapper, L.F., Lusardi, A., Panos, G.A., 2013. Financial literacy and its consequences: evidence from Russia during the financial crisis. J. Bank. Financ. 37, 3904–3923.
La Porta, R., Lopez-de-Silanes, F., Shleifer, A., 2008. The economic consequences of legal origins. J. Econ. Lit. 46, 285–332.
Lane, P.R., Milesi-Ferretti, G.M., 2011. The cross-country incidence of the global crisis. IMF Econ. Rev. 59, 77–110.
Levine, R., Zervos, S., 1996. Stock market development and long-run growth. World Bank Econ. Rev. 10, 323–339.

Lewis, K., 1999. Trying to explain home bias in equities and consumption. J. Econ. Lit. 37, 571–608.
Lusardi, A., 2008. Household Saving Behavior: The Role of Financial Literacy, Information, and Financial Education Programs. NBER, Working Paper No. 13824.
Lusardi, A., Michaud, P.-C., Mitchell, O., 2013. Optimal Financial Literacy and Wealth Inequality. NBER, Working Paper No. 18669.
Lusardi, A., Mitchell, O., 2007. Financial Literacy and Retirement Planning: New Evidence from the Rand American Life Panel. Center for Financial Studies (CFS), Working Chapter No. 2007/33.
Lusardi, A., Mitchell, O., 2011a. Financial literacy and planning: implications for retirement wellbeing. In: Mitchell, O.S., Lusardi, A. (Eds.), Financial Literacy: Implications for Retirement Security and the Financial Marketplace. Oxford University Press, Oxford, pp. 17–39.
Lusardi, A., Mitchell, O., 2011b. Financial literacy and retirement planning in the United States. J. Pension Econ. Financ. 10, 509–525.
Lusardi, A., Mitchell, O., 2011c. Financial literacy around the world: an overview. J. Pension Econ. Financ. 10, 497–508.
Lusardi, A., Micthell, O., 2014. The economic importance of financial literacy: theory and evidence. J. Econ. Lit. 52, 5–44.
Lusardi, A., Tufano, P., 2009. Debt Literacy, Financial Experiences and Overindebtedness. Center for Research on Pensions and Welfare Policies, Working Paper No. 83.
Magi, A., 2009. Portfolio choice, behavioral preferences and equity home bias. Q. Rev. Econ. Financ. 49, 501–520.
Milesi-Ferretti, G.M., Tille, C., 2011. The Great Retrenchment: International Capital Flows during the Global Financial Crisis, Working Papers 382011. Hong Kong Institute for Monetary Research.
Mishra, A., 2011. Australia's equity home bias and real exchange rate volatility. Rev. Quant. Financ. Account. 37, 223–244.
Mizen, P., Packer, F., Remolona, E., Tsoukas, S., 2012. Why Do Firms Issue Abroad? Lessons from Onshore and Offshore Corporate Bond Finance in Asian emerging markets. Bank for International Settlements, Working Paper 401.
Mizen, P., Tsoukas, S., 2010. What Effect has Bond Market Development in Emerging Asia had on the Issuance of Corporate Bonds? Hong Kong Monetary Authority, Working Paper 18.
Mizen, P., Tsoukas, S., 2012. The response of the external finance premium in Asian corporate bond markets to financial characteristics, financial constraints and two financial crisis. J. Bank. Financ. 36, 3048–3059.
Mondria, J., Wu, T., 2010. The puzzling evolution of the home bias, information processing and financial openness. J. Econ. Dyn. Control 34, 875–896.
Mondria, J., Wu, T., 2013. Imperfect financial integration and asymmetric information: competing explanations of the home bias puzzle? Can. J. Econ. 46, 310–337.
Organization for Economic Co-Operation and Development (OECD), 2005. Improving Financial Literacy: Analysis of Issues and Policies. OECD, Paris, France.
Puri, M., Robinson, D.T., 2007. Optimism and economic choice. J. Financ. Econ. 86, 71–99.
Raddatz, C., Schmukler, S., 2012. On the international transmission of shocks: micro-evidence from mutual fund portfolios. J. Int. Econ. 88, 357–374.
Rose, A.K., Spiegel, M.M., 2009. International financial remoteness and macroeconomic volatility. J. Dev. Econ. 89, 250–257.
Rowland, P.F., Tesar, L.L., 2004. Multinationals and the gains from international diversification. Rev. Econ. Dyn. 7, 789–826.
Sercu, P., Vanpée, R., 2007. Home Bias in International Equity Portfolios: A Review. Katholieke Universiteit Leuven, Faculty of Economics and Applied Economics, AFI 0710.
Sercu, P., Vanpée, R., 2012. The home bias puzzle in equity portfolios. In: Baker, H.K., Riddick, L.A. (Eds.), Survey of International Finance. Oxford University Press.
Solnik, B., 1974. Why not diversify internationally rather than domestically? Financ. Anal. J. 30, 48–52+54.
Stango, V., Zinman, J., 2009. Exponential growth bias and household finance. J. Financ. 64, 2807–2849.
Stulz, R.M., 1981. On the effects of barriers to international investment. J. Financ. 36, 923–934.
Tesar, L., Werner, I., 1995. Home bias and high turnover. J. Int. Money Financ. 14, 467–492.
Van Rooij, M., Lusardi, A., Alessie, R., 2011. Financial literacy and stock market participation. J. Financ. Econ. 101, 449–472.